

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

# Application Review

**Issue Date: DRAFT**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Betsy Huddleston  
**Date of Last Inspection:** 12/09/2015  
**Compliance Code:** 3 / Compliance - inspection

<p align="center"><b>Facility Data</b></p> <p><b>Applicant (Facility's Name):</b> Avoca Incorporated</p> <p><b>Facility Address:</b>          Avoca Incorporated          841 Avoca Farm Road          Merry Hill, NC 27957</p> <p><b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec  <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing</p> <p><b>Facility Classification: Before:</b> Title V <b>After:</b> Title V  <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V</p>				<p align="center"><b>Permit Applicability (this application only)</b></p> <p><b>SIP:</b> N/A  <b>NSPS:</b> N/A  <b>NESHAP:</b> N/A  <b>PSD:</b> N/A  <b>PSD Avoidance:</b> N/A  <b>NC Toxics:</b> N/A  <b>112(r):</b> N/A  <b>Other:</b> N/A</p>																																																			
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<p><b>Review Engineer:</b> Kevin Godwin</p> <p><b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____</p>					<p align="center"><b>Comments / Recommendations:</b></p> <p><b>Issue</b> 01819/T47  <b>Permit Issue Date:</b> XX  <b>Permit Expiration Date:</b> XX</p>																																																		

## I. Introduction

- A. According to the renewal application, Avoca owns and operates a facility that extracts oils and nutrients from various types of plants for use in flavorants, fragrances, food additives, and dietary supplements. Process operations include rotocel, recovery, concrete, sclareol re-crystallization (SFG), sclareolide (SDE-1 and 2), plant nutrient extraction (PNE), ethyl vanillin glucoside (EVG), botanical extraction, and biomass extraction. Miscellaneous operations include; three No. 2 fuel oil-fired boilers (two 20.3 million Btu per hour heat input and one 25.2 million Btu per hour input), two biomass boilers (24 million Btu per hour each), one No. 2 fuel oil/propane-fired rotary dryer (30 million Btu per hour heat input), four No. 2 fuel oil-fired emergency generators, one limited use emergency generator, one No. 2 fuel oil-fired fire water pump, and one wastewater treatment plant aeration tank.
- B. The application to renew the existing Title V air quality permit was received by the Division of Air Quality (DAQ) on October 31, 2014, and is currently covered by the application shield provided in 15A NCAC 02Q .0512.
- C. The Permittee has not proposed any changes to the existing Title V operating permit as part of the renewal process. The renewed permit will include the permit revisions associated with the following applications:

0800044.12B (rec'd October 1, 2012) – Step 2 of a significant modification under 15A NCAC 02Q .0501(c)(2) for the addition of two biomass boilers (ID Nos. BB1 and BB2) and rotary dryer (ID No. ES-RD),

0800044.14A (rec'd May 30, 2014) – Step 2 of a significant modification under 15A NCAC 02Q .0501(c)(2) for the addition of a dryer (ID No. D-3001) and reactor (ID No. R-3002) to the SFG operations,

0800044.15A (rec'd September 4, 2015) – PSD application for an expansion of the SFG operations and adding the following equipment;

- One 12,500 gallon storage tank (ID No. T-3006)
- One 12,500 gallon process tank (ID No. T-3007)
- Two reactors (ID Nos. R-3003 and R-3004) with process condensers (ID Nos. EX-3004 and ES-3005)
- One centrifuge (ID No. C-3002)
- One dryer with (ID No. D-3002) with process condenser (ID No. ES-3006) and a chilled water control condenser (ID No. CD-3002)

Optional controls – chilled water control condenser (ID No. CD-3003) and mineral oil scrubber (ID No. CD-3004-S).

The entire SFG process operations were proposed to be modified, were deemed a major modification under the PSD regulations, and were included in the PSD review. The PSD permit was issued on January 12, 2016.

0800044.16A (rec'd January 13, 2016) – PSD application for an expansion of the SDE operations (i.e. SDE-2) and adding the following equipment;

- Mineral scrubber system consisting of a chilled water control condenser (ID No. CD-4002) in series with a mineral oil scrubber (ID No. CD-4003-S) installed to control:
  - One 17,900 gallon virgin solvent tank (ID No. T-4001)
  - Two 6,000 gallon process tanks (ID Nos. T-4017 and T-4018)
  - Three 4,200 gallon reactors (ID Nos. R-4004, R-4005, and R-4044) with process condensers (EX-4001, EX-4002, and EX-4003)
  - One 1,500 gallon reactor (ID No. R-4015)
  - One centrifuge (ID No. C-4001)
  - One dryer with (ID No. D-4001) with process condenser (EX-4004) and a chilled water control condenser (ID No. CD-4001)
- Process Equipment Leaks (ID No. ES-4000-F)
- SDE-2 process wastewater stream (ID No. ES-4000-WW).

The existing SDE operations were re-identified as SDE-1. There were no modifications to SDE-1 and PSD review did not apply to SDE-1.

Avoca proposed to construct a new SDE process, which was identified as SDE-2 and is listed above. The proposed SDE-2 operations were deemed a major modification under the PSD rules and thus was processed under the PSD regulations. The PSD permit was issued on July 5, 2016.

Technical reviews for each of the above applications are included as attachments to this document.

- Attachment A: PSD modification for application 0800044.16A
- Attachment B1: Final Review for PSD modification for application 0800044.15A
- Attachment B2: Preliminary Review for PSD modification for application 0800044.15A
- Attachment C: Significant modification for application 0800044.14D and .14E
- Attachment D: Significant modification for application 0800044.12A
- Attachment E: Significant modification for application 0800044.13A
- Attachment F: Excerpt from application memorializing the PSD/NSR calculation methods
- Attachment G: Significant modification for application 0800044.11B

## II. Changes to Existing Title V Air Permit

The following table provides a summary of changes to the permit.

Pages	Section	Description of Changes
Cover and throughout	--	- Updated all dates and permit revision numbers. - Replaced the word 'assure' with 'ensure'.
N/A	Insignificant Activities List	Moved five steam heated hot boxes (ID No. I-HB-1 through I-HB-5) from permitted equipment table to insignificant activities list and included I-HB-5. Also included SFG Packaging area equipped with bagfilter (ID No. I-SFG-PKG).
17, 19, 33, 34, 35, and 36	2.1 C., D., G., H., I., and 2.2 A.1.	Removed reference to regulation 15A NCAC 02Q .0958 and the related condition.
11	2.1 A.5.	Included MACT Subpart DDDDD language.
20	2.1 D.2.c.	Revised 15A NCAC 02D .0521 "Control of Visible Emissions" monitoring from monthly to semiannual observations.
25	2.1 E.6.	Included MACT Subpart DDDDD language.
52	2.2 C.	Included ID Nos. for eleven process tanks in the SDE-1 operations and removed four steam heated hot boxes.

## III. Statement of Compliance

- A. DAQ has reviewed the facility's compliance status. The facility was last inspected in December 2015 by Ms. Betsy Huddleston of the Washington Regional Office (WARO). According to the inspection report, the facility appeared to be operating in full compliance with all applicable requirements.
- B. The inspection report includes the 5-yr compliance history as follows:
  - **NOV 12/10/2008**  
2,464 pounds of n-hexane and 5,236 pounds of hexane isomers (not n-hexane) emitted during an uncontrolled release from the Sclareolide Operation over a three-hour period. DAQ WaRO did not recommend Enforcement because it was found to be an accident (operator error) and the facility had a substantial monetary loss.
  - **NOV/NRE 10/31/2012**  
**Case No. 2012-042, Assessed \$4,549**  
Failed particulate stack test 6/26/2012 for Boiler MACT DDDDD compliance demonstration.

- **NOD 3/05/2014**

Boilers ES-BB1 and ES-BB2 January-June 2013 oxygen analyzer and steam meter downtimes were in excess of the thresholds considered acceptable in the NCCEP.

#### IV. Review of Applicable Regulations

##### A. No. 2 Fuel Oil-Fired Boilers (ID Nos. H-101, H-102, and H-103)

1. Applicable Regulatory Requirements
  - a. 15A NCAC 02D .0503,
  - b. 15A NCAC 02D .0516,
  - c. 15A NCAC 02D .0521(d) and (c), and
  - d. 15A NCAC 02D .1109 [112(j) Case-by-Case MACT] applicable until May 19, 2019
  - e. 15A NCAC 02Q .1111 MACT, 40 CFR Part 63, Subpart DDDDD, applicable beginning May 20, 2019, the boilers are considered existing sources.
2. The only new regulation that applies is 15A NCAC 02D .1111, 40 CFR Part 63, Subpart DDDDD. A new condition referencing the requirements under Subpart DDDDD will be placed in the renewed permit. No other regulatory review is required at this time.

##### B. Emergency Engines (ID Nos. ES-PkGen1, ES101, ES102, ES103, ES104, FP)

1. Applicable Regulatory Requirements
  - a. 15A NCAC 02D .0516,
  - b. 15A NCAC 02D .0521,
  - c. 15A NCAC 02D .1111, 40 CFR Part 63, Subpart ZZZZ, and
  - d. 15A NCAC 02Q .0317, for avoidance of 02D .0530 "Prevention of Significant Deterioration" (ID No. ES-PkGen1)
2. No new applicable regulations apply to these sources as part of the Title V permit renewal. No other regulatory review is required at this time.

##### C. Rotocel Operations, including:

- Rotocel extractor, desolventizer, and solvent separation/recovery (ID No. ES-1001-2-1-P) and one associated chilled water condenser (ID No. CD-31209) venting to one packed tower scrubber (ID No. CD-1001-2-S-1);
- Two storage and recycle tanks (ID No. ES-M-125A and M-125B) and one associated chilled water condenser (ID No. CD-1001-2-C-1) venting to one packed tower scrubber (ID No. CD-1001-2-S-1);
- Process equipment leaks (ID No. ES-1001-2-1-F); and
- Rotocel Operations wastewater stream (ID No. ES-1001-2-1-WW)

##### Recovery Operations, including:

- Arcon process tank M-1 (ID No. ES-1001-1-1-P1) and one associated chilled water condenser (ID No. CD-1001-1-3) venting to one packed tower scrubber (ID No. CD-1001-2-S-1);
- One chilled water condenser (ID No. CD-1001-1-T5B) venting to packed tower scrubber (ID No. CD-1001-2-S-1) controlling emissions from:
  - Stripper T-5 and receiver M-21 (ID No. ES-1001-1-1-P2); and
  - Seven fixed roof process tanks of various capacities and one fixed roof methanol storage tank (ID No. ES-1001-1-1-P3);
- Process equipment leaks (ID No. ES-1001-1-1-F); and
- Recovery Operations wastewater stream (ID No. ES-1001-1-1-WW)

1. Applicable Regulatory Requirements
  - a. 15A NCAC 02D .0530,
  - b. 15A NCAC 02D .0614,

- c. 15A NCAC 02D .1100 (state-enforceable only),
    - d. 15A NCAC 02D .1111, 40 CFR Part 63, Subpart FFFF, and
    - e. 15A NCAC 02D .1806 (state-enforceable only)
  - 2. No new applicable regulations apply to these sources as part of this Title V permit renewal. No regulatory review is required at this time.
- D. Botanical Extraction Operations, including:
- Immersion extractor Z-1001, desolventizer Z-1002, day tank 90024, first-stage evaporator EX-1012, second stage evaporator EX-1013, distillation column EX-90008 and nine process tanks of various capacities (ID No. ES-1001-11-1-P) and one associated chilled water condenser (ID No. CD-1001-11-EX1002) venting to one cryogenic (nitrogen) condenser system (ID No. CD-1001-11-EX1003);
  - Plant Material Grinder (ID No. MHZ-1002) and one associated bagfilter (ID No. CD-1003-4-1);
  - Process equipment leaks (ID No. ES-1001-11-1-F); and
  - Botanical extraction operations wastewater stream (ID No. ES-1001-11-WW)
- Biomass Extraction Operations, including:
- Biomass extraction debagging (ID No. ES-1004-1) and one associated cartridge filter (ID No. CD-1004-1-FF1);
  - Immersion extractor Z-41001, desolventizer Z-41002, day tank 490025, iso-hexane storage tank 490024, first-stage evaporator EX-41012, second stage evaporator EX-41013, distillation column EX-490008 and nine process tanks of various capacities (ID No. ES-1004-2-P) and one associated chilled water condenser (ID No. CD-1004-2EX1002) venting to one cryogenic (nitrogen) condenser system (ID No. CD-1004-2EX1003);
  - Process equipment leaks (ID No. ES-1004-2-F);
  - Wastewater tanks and other similar vessels (ID No. ES-1004-2-WW);
  - Biomass extraction operations wastewater stream (ID No. ES-1003-10-WW);
  - Biomass silo loadout (ID No. ES-1004-2Silo) and one associated bagfilter (ID No. CD-1004-2-FF2); and
  - Molecular sieve (ID No. ES-MSDU-1024)
1. Applicable Regulatory Requirements
- a. 15A NCAC 02D .0515,
  - b. 15A NCAC 02D .0521(d),
  - c. 15A NCAC 02D .0530,
  - d. 15A NCAC 02D .0614,
  - e. 15A NCAC 02D .1100 (state-enforceable only),
  - f. 15A NCAC 02D .1806 (state-enforceable only), and
  - g. 15A NCAC 02D .1111, 40 CFR Part 63, Subpart FFFF
2. No new applicable regulations apply to these sources as part of this Title V permit renewal. No regulatory review is required at this time.
- E. Two biomass boilers (ID Nos. ES-BB1 and ES-BB2) and an associated propane/No. 2 fuel oil-fired rotary dryer (ID No. ES-RD) operated in series controlled by a cyclone (ID No. CD-BB1C) in series with a bagfilter (ID No. CD-BB1BH)
1. Applicable Regulatory Requirements
- a. 15A NCAC 02D .0503 (for boilers),
  - b. 15A NCAC 02D .0515 (for rotary dryer),
  - c. 15A NCAC 02D .0516 (for boilers and rotary dryer),
  - d. 15A NCAC 02D .0521 (for boilers and rotary dryer),
  - e. 15A NCAC 02D .0524, 40 CFR Part 60, Subpart Dc, the boilers are considered new sources (constructed after June 9, 1989),

- f. 15A NCAC 02Q .1111 MACT, 40 CFR Part 63, Subpart DDDDD, the boilers are considered new sources (constructed after June 4, 2010),
    - g. 15A NCAC 02Q .0317, Avoidance of 15A NCAC 02D .0530 (for boilers and rotary dryer), and
    - h. 15A NCAC 02Q .0317, Avoidance of 15A NCAC 02D .1112 (for rotary dryer)
  2. No new applicable regulations apply to these sources as part of this Title V permit renewal. The existing permit includes a condition referencing the requirements of NSPS Subpart Dc. According to the application, all required notifications under Subpart Dc have been submitted. An expanded condition referencing the requirements under MACT Subpart DDDDD is placed in the renewed permit. No other regulatory review is required at this time.
- F. Sclareol Recrystallization (SFG) Operations, including:
- One process tank (ID No. T-3001)\*
  - Four process tanks (ID Nos. T-3002 through 3005)\*
  - One storage tank (ID No. T-3006)\*
  - One process tank (ID No. T-3007)\*
  - Two centrifuges (ID Nos. C-3001 and C-3002)\*
  - One reactor (ID No. R-3001) equipped with two process chilled water condensers (EX-3001 and EX-3002) with control chilled water condenser (ID No. CD-3001)\*
  - One reactor (ID No. R-3002)\* equipped with a process chilled water condenser (EX-3003)
  - One reactor (ID No. R-3003)\* equipped with a process chilled water condenser (EX-3004)
  - One reactor (ID No. R-3004)\* equipped with a process chilled water condenser (EX-3005)
  - One steam heated dryer (ID No. D-3001) equipped with a process chilled water condenser (EX-3002) with control chilled water condenser (ID No. CD-3001)\*
  - One steam heated dryer (ID No. D-3002) equipped with a process chilled water condenser (EX-3006) with control chilled water condenser (ID No. CD-3002)\*
  - Process equipment leaks (ID No. ES-1003-10-F)
  - SFG Operations wastewater stream (ID No. ES-1003-10-WW)
- \* These emission sources may be controlled with a chilled water condenser (**ID No. CD-3003**) in series with a mineral oil scrubber (**ID No. CD-3004-S**). These control devices are optional controls. The Permittee has the option to construct or not construct these devices and has the option to operate or not operate these devices.
1. Applicable Regulatory Requirements
    - a. 15A NCAC 02D .0530,
    - b. 15A NCAC 02D .1100 (state-enforceable only), and
    - c. 15A NCAC 02D .1806 (state-enforceable only)
  2. No new applicable regulations apply to these sources as part of this Title V permit renewal. No regulatory review is required at this time.
- G. Sclareolide (SDE-1) Operations, including:
- Eleven (11) process tanks of various capacities (ID No. ES-1001-1-3-P, Tank ID Nos. M-2, M-4, M-4A, M-39, M-44, M-15, M-17, M-17A, M-16, M-11, and TK-1210);
  - One centrifuge (ID No. G-17);
  - One steam-heated dryer with process condenser (ID No. D-1202);
  - Filters (ID No. ES-1001-1-3-Filters);
  - SDE-1 process equipment leaks (ID No. ES-1001-3-F); and
  - SDE-1 wastewater stream (ID No. ES-1001-1-3-WW)
1. Applicable Regulatory Requirements
    - a. 15A NCAC 02D .1806, and
    - b. 15A NCAC 02D .1111, 40 CFR Part 63, Subpart FFFF

2. No new applicable regulations apply to these sources as part of this Title V permit renewal. No regulatory review is required at this time.

H. Sclareolide (SDE-2) Operations, including:

- One chilled water condenser (ID No. CD-4002) in series with a mineral oil scrubber (ID No. CD-4003-S) controlling emissions from the following:
  - One 17,900 gallon virgin solvent tank (ID No. T-4001);
  - Two 6,000 gallon process tanks (ID Nos. T-4017 and T-4018);
  - One 4,200 gallon reactor with process condenser (EX-4001) (ID No. R-4004);
  - One 4,200 gallon reactor with process condenser (EX-4002) (ID No. R-4005);
  - One 4,200 gallon reactor with process condenser (EX-4003) (ID No. R-4044);
  - One 1,500 gallon reactor (ID No. R-4015); and
  - One centrifuge (ID No. C-4001)
- One dryer with process condenser (EX-4004) with associated chilled water condenser (ID No. CD-4001) in series with a chilled water condenser (ID No. CD-4002) and mineral oil scrubber (ID No. CD-4003-S)
- SDE-2 process equipment leaks (ID No. ES-4000-F); and
- SDE-2 wastewater stream (ID No. ES-4000-WW)

1. Applicable Regulatory Requirements

- a. 15A NCAC 02D .0530,
- b. 15A NCAC 02D .1806 (state-enforceable only), and
- c. 15A NCAC 02D .1111, 40 CFR Part 63, Subpart FFFF

2. No new applicable regulations apply to these sources as part of this Title V permit renewal. No regulatory review is required at this time.

V. **Compliance Assurance Monitoring (CAM)**

Pursuant to 40 CFR 64.2, the provisions of the CAM rule are applicable to emission units that meet all of the following criteria:

1. The unit is subject to an emissions limitation AND uses a control device to achieve compliance with the limit;
2. The unit has pre-control potential emissions that are equal to or greater than 100% of the amount (in tpy) required for a source to be classified as a major source; and
3. The unit is not exempt under 40 CFR 64.2(b).

SFG Operations – The SFG operations have PSD BACT limitations finalized on January 21, 2016. The controls are now voluntary and thus not subject to CAM.

Boilers – The boilers are subject to 40 CFR 63 Subpart DDDDD, and thus exempt from applicability to CAM for PM control. The rotary dryer is vented to the same control devices as the boilers, but the dryer is not subject to the Boiler MACT. According to the application, the pre-controlled PM emissions from the rotary dryer will be less than the CAM triggering thresholds. The boilers and rotary dryer are not subject to CAM requirements.

Emergency Generator – The limited use generator is equipped with a catalytic oxidizer which controls VOC and CO. The avoidance limit is for NOx which is not controlled by the control device, thus the unit is not applicable to CAM.

The following table taken from the application provides a summary of CAM sources.

Source Name	DAQ Applicable Rule	Pollutant	Uncontrolled Emissions (tpy)	Major Source Threshold (tpy)	Subject to CAM?
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Rotocel operations	15A NCAC 02D .0530	VOC	> 100	100	Yes – included in current permit
Recovery operations	15A NCAC 02D .0530	VOC	> 100	100	Yes – included in current permit
Sclareol Recrystallization (SFG)	Avoidance of 15A NCAC 02D .0530	VOC	< 100	100	No as described above
Sclareolide (SDE)	No applicable regulation		< 100	100	No
Plant Nutrient Extraction (PNE)	No applicable regulation	VOC	< 100	100	No
Ethyl Vanillin Glucoside (EVG)	No applicable regulation	VOC	< 100	100	No
Botanical Extraction	15A NCAC 02D .0530	VOC	> 100	100	Yes – included in current permit
Biomass boilers	15A NCAC 02Q .1111 MACT Subpart DDDDD	PM	< 100	100	No as described above
Rotary dryer	15A NCAC 02Q .1111 MACT Subpart DDDDD	PM	< 100	100	No as described above.
Emergency generator	Avoidance of 15A NCAC 02D .0530	NOx	< 100	100	No as described above.

#### VI. Maximum Achievable Control Technology (MACT) Applicability

Avoca is a major source of hazardous air pollutants (HAP). The facility has emergency generators subject to 40 CFR 63, Subpart ZZZZ – RICE MACT. The current permit includes a condition detailing the requirements under Subpart ZZZZ.

The facility has boilers subject to 40 CFR 63, Subpart DDDDD. The existing permit includes a condition for 15A NCAC 02D .1109 (112(j) Case-by-Case MACT) for boilers (ID Nos. H-101, 102, and 103) valid through May 19, 2019. A new condition referencing the requirements under 40 CFR 63, Subpart DDDDD valid beginning May 20, 2019 is placed in the renewed permit. For the new biomass boilers (ID Nos. ES-BB1 and BB2), compliance with Subpart DDDDD was required upon start-up. The boilers are considered stokers designed to burn biomass/bio-based solids. A condition referencing the requirements under Subpart DDDDD for the boilers is included in the renewed permit.

The rotocel operations, recovery operations, concrete operations, SDE operations, EVG operations, PNE operations, and the botanical and biomass extraction operations are subject to 40 CFR 63, Subpart FFFF. A condition referencing the requirements under Subpart FFFF is included in the existing permit. No changes are necessary.

#### VII. Prevention of Significant Deterioration (PSD)

According to the application, the Avoca facility has previously been identified by DAQ as a chemical plant and is a 100 tpy major source. Fugitives are included in the applicability determination. The facility is currently operating under PSD BACT requirements for multiple emission sources as well as PSD avoidance conditions for several emission sources.

#### VIII. New Source Performance Standards (NSPS)



The biomass boilers (24 million Btu per hour each, ID Nos. ES-BB1 and BB2) are subject to 40 CFR 60, Subpart Dc. According to the application, the boilers began operation in October 2011 and are considered new sources under Subpart Dc. All required notifications have been sent. The applicable requirements for the boilers are: 60.48c(a)(1) inclusion of the design heat input rating and the types of fuels to be combusted, and 60.48c(g) requiring the facility to record and maintain the amounts of each fuel used during each calendar month. The existing permit includes a condition referencing the requirements under Subpart Dc. No changes are necessary.

#### **IX. Toxic Air Pollutant (TAP) Procedures**

Avoca previously provided a model that documented compliance with NC TAP in the April 2013 construction application (0800044.13A) for permit revision 01819T40. According to the technical review dated June 6, 2013,

“Avoca has provided air dispersion modeling that demonstrates compliance with NC Air Toxics. The modeling was reviewed by Mr. Alex Zarnowski of the Air Quality Analysis Branch (AQAB) on May 1, 2013. According to the memo, the modeling adequately demonstrates facility-wide compliance on a source-by-source basis for n-hexane and hexane isomers. The pollutant with maximum impact is n-hexane at 91.73% of the Acceptable Ambient Level (AAL). Avoca requests to remove TAP from the permit for all sources covered under the NESHAP. DAQ agrees that this is not an unacceptable risk. Therefore, the request is granted. A condition will be included in the revised permit requiring a TAP evaluation for increases from any non-NESHAP sources.”

#### **X. Insignificant Activities**

The existing permit includes a list of insignificant activities under 15A NCAC 02Q .0503(8). DAQ has confirmed that maximum emissions from these sources are less than 5 tpy of all regulated criteria pollutants and less than 1,000 lb/year HAP. Avoca has documented that the SFG packaging operation emissions are less than the 5 tpy uncontrolled threshold and requested it to be added to the insignificant activity list upon permit renewal.

#### **XI. Permitting History Since Issuance of Title V Permit Renewal**

<b>Permit</b>	<b>Issue Date</b>	<b>Description</b>
01819T37	August 17, 2010	TV permit renewal issued with an expiration date of July 31, 2015.
01819T38	June 3, 2011	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2) for the addition of the following: <ul style="list-style-type: none"> <li>two new biomass/bio-based solids-fired boilers (18.6 million Btu per hour maximum heat input, ID Nos. ES-BB1 and ES-BB2) controlled by a cyclone (144 inches in diameter, ID No. CD-BB1C) in series with a dry lime injected bagfilter (8,900 square feet of filter area, ID No. CD-BB1BH), and</li> <li>one No. 2 fuel oil-fired rotary dryer (6.0 million Btu per hour maximum heat input, ID No. ES-RD).</li> </ul>
--	--	“Part 2” permit application for the new biomass/bio-based solids-fired boilers (ID Nos. ES-BB1 and ES-BB2) received on October 9, 2012. The permit application will be consolidated with the application for TV permit renewal.
01819T39	January 4, 2013	The air permit was reopened for cause to correct specific condition (2.1 E.7.) pertaining to MACT Subpart DDDDD for two biomass boilers (ID Nos. ES-BB1 and BB2). The condition contained an incorrect compliance date and was corrected under the permit modification.

Permit	Issue Date	Description
01819T40	June 6, 2013	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2) to modify the SFG operations by replacing the current dryer with a new larger capacity dryer (ID No. D-3001). A new larger reactor (ID No. R-3002) equipped with a process condenser (ID No. EX-3003) was also added under this modification. The smaller reactor (ID No. R-3001) was to be used as a secondary reactor after modification.
01819T41	November 26, 2013	<p>Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2). The following changes were made under the permit modification.</p> <ul style="list-style-type: none"> <li>• Updated CO and NOx emission factors for the biomass boilers (ID Nos. ES-BB1 and BB2). Stack testing performed on December 6, 2011 while firing wood showed measured emission factors of 0.068 lb/MMBtu for NOx and 0.0008 lb/MMBtu for CO.</li> <li>• Replaced the existing six MMBtu/hr burner on the rotary dryer with a 30 MMBtu/hr burner and added propane as a fuel.</li> <li>• Updated the maximum burner rating of the two (2) biomass boilers. The boilers heat input rating was increased from the permitted 18.6 MMBtu/hour each to a maximum heat input to 24 MMBtu/hour each.</li> <li>• Limited VOC emissions from the rotary dryer to less than 40 tpy to avoid triggering PSD requirements.</li> <li>• Limited n-hexane from the rotary dryer to less than 10 tons per year to avoid being subject to the 112(g) requirements listed in 15A NCAC 2D .1112.</li> <li>• Clarified the operating configuration of the sage drying system.</li> </ul>
01819T42	January 27, 2014	<p>Air permit processed as a minor modification with the following changes:</p> <ul style="list-style-type: none"> <li>• Replaced two underground storage tanks (ID No. ES-1001-2-1-P2) with two above ground storage tanks (20,000 gallons capacity each, ID Nos. ES-M-125A and 125B).</li> <li>• Added a new storage tank associated with the Plant Nutrient Extraction (PNE) operations (9,500 gallons capacity, ID No. ES-TK-PNE-1).</li> <li>• Added a sage briquette making machine (ID No. I-Briquette) with enclosed conveyors.</li> <li>• Added a molecular sieve (ID No. MSDU-1024) as part of the description for the Biomass Extraction operations (which was added to Air Permit No. 01819T41).</li> <li>• Included existing diesel emergency generator (401 horsepower, ID No. E104) to the permit.</li> </ul>
--	--	"Part 2" permit application for changes to the SFG operations and modifications to boilers (ID Nos. ES-BB1 and BB2) and rotary dryer (ID No. ES-RD) received on May 30, 2014. The permit application will be consolidated with the application for TV permit renewal.
--	--	Permit application for renewal of the Title V permit was received on October 31, 2014.
01819T43	December 19, 2014	<p>Air permit processed as a minor modification with the following changes:</p> <ul style="list-style-type: none"> <li>• Updated capacity of above ground storage tanks (ID Nos. ES-M-125A and 125B) to 19,500 gallons.</li> <li>• Added a condenser (ID No. CD-3002) to the existing dryer (ID No. D-3001) in the SFG operations.</li> </ul>

Permit	Issue Date	Description
01819T44	March 10, 2015	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2), which was consolidated with a minor modification. The following changes were made under the permit modification. <ul style="list-style-type: none"> <li>• Added a new dryer equipped with chilled water condenser and distillate tank (ID No. D-1002) after the centrifuge (ID No. C-1203) in the PNE operations.</li> <li>• Removed a underground ethanol storage process tank from the PNE operations (ID No. TK-9214).</li> <li>• Modified conditions to indicate the scrubbers are not required to operate during PNE and EVG operations.</li> <li>• Re-evaluated the operating temperature limit for the cryogenic condensers in the Botanical/Biomass Extraction Operations.</li> </ul>
01819T45	January 12, 2016	Air permit processed as a PSD modification for the expansion of the SFG operations.
01819T46	July 5, 2016	Air permit processed as a PSD modification for the expansion of the SDE operations.

#### **XII. Other Regulatory Considerations**

- An application fee is not required for this renewal application.
- A zoning consistency determination is not required for this renewal application.
- A Professional Engineer's Seal is not required for this renewal application.
- DAQ Title V Equipment Editor (TVEE) database update was approved with the T46 permit revision.

#### **XIII. Draft/Proposed Permit Review Summary**

- Ms. Betsy Huddleston (WARO) was provided a draft permit for review on September 22, 2016.
- Mr. Brian Conner (Avoca) was provided a draft permit for review on September 22, 2016.
- NCDAQ published a Public Notice of the proposed Title V permit renewal in the XXXX edition of XXXX.
- U.S. EPA Region IV was provided a draft permit for review on XXXX.

#### **XIV. Recommendations**

This Title V Permit Renewal for Avoca Inc., Merry Hill, Bertie County, North Carolina has been reviewed by DAQ to determine compliance with all procedures and requirements. DAQ has determined that this facility appears to be complying or is expected to achieve compliance as specified in the permit with all applicable requirements.

**ATTACHMENT A**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Permit Issue Date: July 5, 2016**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Betsy Huddleston  
**Date of Last Inspection:** 12/09/2015  
**Compliance Code:** 3 / Compliance - inspection

<b>Facility Data</b>						<b>Permit Applicability (this application only)</b>	
<b>Applicant (Facility's Name):</b> Avoca Incorporated  <b>Facility Address:</b> Avoca Incorporated 841 Avoca Farm Road Merry Hill, NC 27957  <b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing  <b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V						<b>SIP:</b> 2D .0530, 2D .0535, 2D .0958, 2D .1806 <b>NSPS:</b> N/A <b>NESHAP:</b> N/A <b>PSD:</b> BACT limit for VOC only <b>PSD Avoidance:</b> N/A <b>NC Toxics:</b> N/A <b>112(r):</b> N/A <b>Other:</b> N/A	
<b>Contact Data</b>						<b>Application Data</b>	
<b>Facility Contact</b>		<b>Authorized Contact</b>		<b>Technical Contact</b>		<b>Application Number:</b> 0800044.16A <b>Date Received:</b> 01/13/2016 <b>Application Type:</b> Modification <b>Application Schedule:</b> PSD <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 01819/T45 <b>Existing Permit Issue Date:</b> 01/12/2016 <b>Existing Permit Expiration Date:</b> 12/31/2020	
Brian Conner Environmental Health & Safety Manager (252) 482-2133 PO Box 129 Merry Hill, NC 27957		David Peele Owner / President (252) 482-2133 PO Box 129 Merry Hill, NC 27957		Samuel Tynch Director of Operations/Engineering (252) 482-2133 PO Box 129 Merry Hill, NC 27957			
<b>Total Actual emissions in TONS/YEAR:</b>							
CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2014	7.34	30.22	1021.10	21.19	0.4600	305.52	195.85 [Methanol (methyl alcohol)]
2013	11.85	27.84	1055.94	18.70	0.4600	250.74	155.43 [Methanol (methyl alcohol)]
2012	13.64	24.08	931.29	43.64	0.4430	214.72	145.25 [Methanol (methyl alcohol)]
2011	17.06	13.79	491.30	2.79	0.6600	123.95	68.53 [Methanol (methyl alcohol)]
2010	13.60	9.07	231.31	1.90	0.4200	67.49	52.54 [Hexane, n-]
<b>Review Engineer:</b> Betty Gatano  <b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____					<b>Comments / Recommendations:</b> Issue 01819/T46 <b>Permit Issue Date:</b> 07/05/2016 <b>Permit Expiration Date:</b> 12/31/2020		

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*Attachment A1 – Revised Permit Condition for 40 CFR Part 63, Subpart FFFF*

## 1.0 Introduction and Purpose of Application

### 1.1 Facility Description & Proposed Change

Avoca Incorporated (Avoca) currently holds Title V Permit No. 01819T45 with an expiration date of December 31, 2020<sup>1</sup> for a chemical extraction facility in Merry Hill, Bertie County, North Carolina. The facility extracts oils and nutrients from various types of plants for use in flavorants, fragrances, food additives, and dietary supplements. The main product at the facility is sclareol/sclareolide. Sclareol is extracted from clary sage grown on farms surrounding the Avoca facility. The extracted material is converted to sclareolide offsite and purified at the Merry Hill facility. Sclareolide is the final product and is used to maintain fragrance potency in perfumes, laundry detergents, and a variety of other products.

There are four processes involved in producing sclareolide – Rotocel, Recovery, Sclareol Recrystallization Operations (SFG), and Sclareolide Operations (SDE).

In the first process, clary sage is augured to a belt that carries it to an extractor called the Rotocel. Hexane isomer is added to the extractor to strip out sclareol from the sage. Spent sage from the Rotocel is sent to a desolventizer, which drains the hexane from the sage. Volatilized hexane is condensed and collected in the solvent separation/recovery tank. Condensed water and hexane separate in this tank (hexane floats), and the recovered hexane is stored in two recycle process tanks. The sage exiting the desolventizer is hot and contains a significant amount of hexane. Most of the hexane flashes fugitively to the atmosphere when the sage is removed from the desolventizer.

The sclareol/hexane material leaving the Rotocel process is sent to the Recovery process. In this step, hexane from the sclareol/hexane mixture is flashed off in the stripper, and the sclareol is mixed in a receiving tank with methanol to further strip out hexane. The resulting purified oil settles to the bottom of the tank and is drawn into buckets. The Recovery process can produce up to 100 cans sclareol oil/day (47 lb/can).

The sclareol buckets are carried to the SFG (sclareol recrystallization) process, where the sclareol oil is crystallized into a white powder. The SFG operations currently consist of a series of tanks, two reactors, a centrifuge, and a dryer. Under Air Permit No. 01819T45, the SFG operations were expanded to add two storage/process tanks, two reactors, a centrifuge, and a dryer. A chilled water control condenser and mineral oil scrubber were added to the permit as optional controls for the SFG operations. In the SFG operations, sclareol and heptane are fed to a reactor, and the crystallized material is sent to a centrifuge and dryer. Heptane recovered from the first pass is reprocessed to recover any additional sclareol. As before, the crystallized material is sent to a centrifuge and dryer. The sclareol comes out of the dryer as a white powder. Heptane recovered from the second pass is again reprocessed to recover any remaining heptane. The residual material remaining after the final heptane recovery is a waste by-product.

The powder is bagged and shipped to an Avoca facility in Wisconsin, where the material is converted from sclareol to sclareolide by yeast (i.e., biological conversion). Sclareolide may also be purchased from a vendor in China. The sclareolide – either from Wisconsin or China – arrives at the Merry Hill facility as a white powder, which is purified in the Sclareolide Operations (SDE). The powder is placed in a tank with water and high purity hexane (40% n-hexane and 60% isohexane). The mixture

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<sup>1</sup> This permit shall expire on the earlier of December 31, 2020 or the date the renewal of Air Permit No. 01819T44 has been issued or denied.

is processed through reactors, a centrifuge, and a dryer. The final, purified sclareolide remains a white powder.

#### PSD Project

A permit application for a modification under 15A NCAC 2D .0530, “Prevention of Significant Deterioration” (PSD), was received on January 13, 2016. Under this permit modification, Avoca is proposing to expand the SDE operations. The existing SDE operations will be called SDE-1 operations, and the new operations will be called SDE-2 operations. The following equipment will be added to the facility as part of the new SDE-2 operations:

- Mineral scrubber system consisting of a chilled water control condenser (ID No. CD-4002) in series with a mineral oil scrubber (ID No. CD-4003-S) installed to control:
  - One 17,900 gallon virgin solvent tank (ID No. T-4001)
  - Two 6,000 gallon process tanks (ID Nos. T-4017 and T-4018)
  - Three 4,200 gallon reactors (ID Nos. R-4004, R-4005, and R-4044) with process condensers (EX-4001, EX-4002, and EX-4003)
  - One 1,500 gallon reactor (ID No. R-4015)
  - One centrifuge (ID No. C-4001)
  - One dryer with (ID No. D-4001) with process condenser (EX-4004) and a chilled water control condenser (ID No. CD-4001)
- Process Equipment Leaks (ID No. ES-4000-F)
- SDE-2 process wastewater stream (ID No. ES-4000-WW).

The proposed project will increase volatile organic compounds (VOC) emissions by more than the PSD significant emission rate (SER) of 40 tons per year. Thus, the proposed project is subject to review and processing under 15A NCAC 2D .0530, PSD. The facility must also comply with other specific NCDAQ air pollution regulations where applicable.

In accordance with PSD requirements, Avoca has conducted a Best Available Control Technology (BACT) analysis, additional impacts (soils, vegetation, visibility) analysis, and to the extent necessary, Class I area analysis.

#### Other Changes

As noted previously, sclareolide from offsite is sent to Avoca to be purified in the SDE operations. Equipment to purify the sclareolide is currently permitted as “Biological Equipment for Purification of Sclareolide” and “Sclareolide (SDE) Operations.” Under this modification, these two processes are being combined on the permit, and equipment is being added and/or removed as necessary to reflect the actual equipment in the existing SDE-1 operations.

#### Permit Renewal and Expiration Date

Avoca submitted an application for a permit renewal on October 31, 2014, or at least nine months prior to the expiration date of July 31, 2015. Therefore, the application shield as specified under 15A NCAC 2Q .0512(b) remains in effect. Because the renewed permit has not yet been issued, the expiration date was changed to December 31, 2020 when Air Permit No. 01819T45 was issued on January 12, 2016. A footnote was also added to the permit stating, “This permit shall expire on the earlier of December 31, 2020 or the date the renewal of Air Permit No. 01819T44 has been issued or denied.”

## 1.2 Plant Location

Avoca is located at 841 Avoca Farm Road, Merry Hill, North Carolina, which is in eastern Bertie County. Bertie County has been classified as in attainment for all pollutants subject to a National Ambient Air Quality Standard (NAAQS).

## 1.3 Permitting History Since Issuance of Title V Permit Renewal

Permit	Issue Date	Description
01819T37	August 17, 2010	TV permit renewal issued with an expiration date of July 31, 2015.
01819T38	June 3, 2011	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2) for the addition of the following: <ul style="list-style-type: none"><li>• two new biomass/bio-based solids-fired boilers (18.6 million Btu per hour maximum heat input, ID Nos. ES-BB1 and ES-BB2) controlled by a cyclone (144 inches in diameter, ID No. CD-BB1C) in series with a dry lime injected bagfilter (8,900 square feet of filter area, ID No. CD-BB1BH), and</li><li>• one No. 2 fuel oil-fired rotary dryer (6.0 million Btu per hour maximum heat input, ID No. ES-RD).</li></ul>
--	--	“Part 2” permit application for the new biomass/bio-based solids-fired boilers (ID Nos. ES-BB1 and ES-BB2) received on October 9, 2012. The permit application will be consolidated with the application for TV permit renewal.
01819T39	January 4, 2013	The air permit was reopened for cause to correct specific condition (2.1 E.7.) pertaining to MACT Subpart DDDDD for two biomass boilers (ID Nos. ES-BB1 and BB2). The condition contained an incorrect compliance date and was corrected under the permit modification.
01819T40	June 6, 2013	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2) to modify the SFG operations by replacing the current dryer with a new larger capacity dryer (ID No. D-3001). A new larger reactor (ID No. R-3002) equipped with a process condenser (ID No. EX-3003) was also added under this modification. The smaller reactor (ID No. R-3001) was to be used as a secondary reactor after modification.



Permit	Issue Date	Description
01819T41	November 26, 2013	<p>Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2). The following changes were made under the permit modification.</p> <ul style="list-style-type: none"> <li>• Updated CO and NOx emission factors for the biomass boilers (ID Nos. ES-BB1 and BB2). Stack testing performed on December 6, 2011 while firing wood showed measured emission factors of 0.068 lb/MMBtu for NOx and 0.0008 lb/MMBtu for CO.</li> <li>• Replaced the existing six MMBtu/hr burner on the rotary dryer with a 30 MMBtu/hr burner and added propane as a fuel.</li> <li>• Updated the maximum burner rating of the two (2) biomass boilers. The boilers heat input rating was increased from the permitted 18.6 MMBtu/hour each to a maximum heat input to 24 MMBtu/hour each.</li> <li>• Limited VOC emissions from the rotary dryer to less than 40 tpy to avoid triggering PSD requirements.</li> <li>• Limited n-hexane from the rotary dryer to less than 10 tons per year to avoid being subject to the 112(g) requirements listed in 15A NCAC 2D .1112.</li> <li>• Clarified the operating configuration of the sage drying system.</li> </ul>
01819T42	January 27, 2014	<p>Air permit processed as a minor modification with the following changes:</p> <ul style="list-style-type: none"> <li>• Replaced two underground storage tanks (ID No. ES-1001-2-1-P2) with two above ground storage tanks (20,000 gallons capacity each, ID Nos. ES-M-125A and 125B).</li> <li>• Added a new storage tank associated with the Plant Nutrient Extraction (PNE) operations (9,500 gallons capacity, ID No. ES-TK-PNE-1).</li> <li>• Added a sage briquette making machine (ID No. I-Briquette) with enclosed conveyors.</li> <li>• Added a molecular sieve (ID No. MSDU-1024) as part of the description for the Biomass Extraction operations (which was added to Air Permit No. 01819T41).</li> <li>• Included existing diesel emergency generator (401 horsepower, ID No. E104) to the permit.</li> </ul>
--	--	<p>"Part 2" permit application for changes to the SFG operations and modifications to boilers (ID Nos. ES-BB1 and BB2) and rotary dryer (ID No. ES-RD) received on May 30, 2014. The permit application will be consolidated with the application for TV permit renewal.</p>
--	--	<p>Permit application for renewal of the Title V permit was received on October 31, 2014.</p>
01819T43	December 19, 2014	<p>Air permit processed as a minor modification with the following changes:</p> <ul style="list-style-type: none"> <li>• Updated capacity of above ground storage tanks (ID Nos. ES-M-125A and 125B) to 19,500 gallons.</li> <li>• Added a condenser (ID No. CD-3002) to the existing dryer (ID No. D-3001) in the SFG operations.</li> </ul>

Permit	Issue Date	Description
01819T44	March 10, 2015	<p>Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2), which was consolidated with a minor modification. The following changes were made under the permit modification.</p> <ul style="list-style-type: none"> <li>• Added a new dryer equipped with chilled water condenser and distillate tank (ID No. D-1002) after the centrifuge (ID No. C-1203) in the PNE operations.</li> <li>• Removed a underground ethanol storage process tank from the PNE operations (ID No. TK-9214).</li> <li>• Modified conditions to indicate the scrubbers are not required to operate during PNE and EVG operations.</li> <li>• Re-evaluated the operating temperature limit for the cryogenic condensers in the Botanical/Biomass Extraction Operations.</li> </ul>
01819T45	January 12, 2016	Air permit processed as a PSD modification for the expansion of the SFG operations.

#### 1.4 Application Chronology

Date	Event
August 21, 2015	Pre-application meeting between NCDAQ and Avoca occurred.
August 25, 2015	Tom Anderson of the Air Quality Analysis Branch of NCDAQ e-mailed personnel from US Forest Service, the Fish and Wildlife Services, and the National Park Service informing them of the project.
August 26, 2015	Jill Webster of the Fish and Wildlife Service sent an e-mail to Tom Anderson indicating that no additional information was needed for the project.
January 13, 2016	PSD permit application received.
January 15, 2016	A permit application acknowledgment letter was issued.
January 19, 2016	A copy of the PSD permit application was sent to Heather Ceron of EPA Region 4.
January 19, 2016	A letter was issued to Avoca indicating the PSD application was deemed complete.
January 19, 2016	Tom Anderson indicated via e-mail that no additional notification was needed for the FLM for the project, including the current permit application.
February 8, 2016	Comments on the permit application were received from Betsy Huddleston of the Washington Regional Office (WARO).
February 18, 2016 through March 8, 2016	The DAQ and consultants for the facility exchanged numerous e-mails regarding the BACT limit proposed in the permit application. The DAQ objected to the proposed BACT limit because required control under 40 CFR Part 63, Subpart FFFF was not accounted for in the proposed limit. In the end, Avoca agreed to meet the BACT limit accounting for controls. However, Avoca wanted to be on record that they disagreed with the regulatory approach for developing BACT ( <i>i.e.</i> , NCDAQ including Part 63 in its analysis) for the SDE expansion.
April 7 and 8, 2016	In phone conversations with Betty Gatano, Dana Norvell, consultant for the facility, indicated the facility has no Group 1 wastewater streams. Ms. Norvell followed up the conversations with an e-mail on April 8, 2016.
April 11, 2016	Draft permit and permit review were forwarded for review.
April 15, 2016	Mark Cuilla, Permitting Supervisor, provided comments.

Date	Event
April 19 and 22, 2016	Betsy Huddleston from the WSRO provided comments on the permit review, followed by comments on the permit.
April 27, 2016	Dana Norvell provided comments.
May 4, 2016	A second draft of the permit and permit view was forwarded for comments.
May 6, 2016	Dana Norvell provided additional comments, which were addressed. On that same day, Betty Gatano addressed the comments and sent a copy to Dana Norvell. Dana Norvell indicated that the permit was acceptable.
May 13, 2016	PSD letters specifying the publication date were mailed/e-mailed.
May 17, 2016	The draft permit and permit review forwarded to public notice.
June 16, 2016	Public comment period ends. No comments received.
July 1, 2016	EPA comment period ends. No comments received.
July 5, 2016	Permit issued.

## 2.0 Modified Emission Sources and Emissions Estimates

After the SFG operations, sclareol is sent offsite to an Avoca facility in Wisconsin, where the sclareol is converted to sclareolide. The product is returned to the Avoca facility in Merry Hill for refining. Avoca may also receive sclareolide from China for refining, as noted previously.

The SDE operations are an intermittent batch process for producing a refined high purity sclareolide. The sclareolide material from offsite is mixed with high purity hexane (n-hexane and isohexane), reacted, washed with potassium hydroxide and water, centrifuged, and dried to higher purity sclareolide.

The SDE operations consists of two types of batches. The primary or extraction batch is the initial step where sclareolide is extracted using hexane, washed, centrifuged, and dried. The hexane from the extraction step is recovered and stored. After 4 or 5 extraction batches, enough hexane has been recovered to process in the recrop batch to extract additional sclareolide. Any recovered sclareolide is washed, centrifuged, and dried as before. Any hexane recovered from the second pass is reprocessed to recover any remaining solvent. The residual material remaining after the final hexane recovery is a waste by-product.

Avoca uses 40% n-hexane and 60% isohexane in the SDE operations to purify the sclareolide. Avoca tracks the usage of n-hexane and isohexane and reports solvent used as solvent lost to determine monthly emissions (i.e., a mass balance based on usage). The facility determined the maximum actual usage data and prorated this amount to the maximum potential operations to determine potential VOC emissions from the expanded process.

The maximum VOC usage for the SDE operations occurred in August 2015 and was 11.15 tons of VOC per month. This value was multiplied by a factor of 3.01 to account for maximum production in the expanded operation. The factor was determined by dividing the desired production after expansion by the current production. In other words, the desired production after expansion is 800 metric tons per year, which is approximately 3 times the maximum production levels of the SDE-1 operations (265.7 metric tons per year). Finally, the resulting value ( $3.01 \times 11.5$  tons of VOC per month) was multiplied by 12 months to arrive at annual VOC emissions after expansion, assuming VOC usage is equal to VOC emissions. The maximum, uncontrolled, VOC emissions are calculated as shown in the following equation:

Uncontrolled VOC emissions = 11.15 tons/month \* 3.01 \* 12 months/year = 402.9 tons VOC/year

This uncontrolled emissions estimate of 402.9 tons per year represents the total amount of VOC lost from the new SDE-2 operations and accounts for both losses through point sources and fugitive emission sources. The point sources are the process vents associated with the equipment in the SDE-2 operations. Fugitive emissions are those emissions that cannot reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Thus, fugitive emissions include not only emissions from equipment leaks (pumps, flanges, valves etc.) but emissions from other areas throughout the SDE-2 operations that are not vented through a stack (e.g., opening reactors, dryers, etc.).

Both the SDE-1 and SDE-2 operations are subject to the “NESHAP for Miscellaneous Organic Chemical Manufacturing,” 40 CFR Part 63, Subpart FFFF. This regulation specifies potential emissions lost from process vents (points sources) are to be calculated from emission equations and methodology in “NESHAP for Pharmaceuticals Production,” 40 CFR Part 63, Subpart GGG (40 CFR 63.1257). Vents from the SDE-1 operations are considered as Group 2 batch process vents based on emissions, while vents from the SDE-2 operations are considered as Group 1 batch process vents. As required by 40 CFR Part 63, Subpart FFFF, Group 1 batch process vents must be controlled. The new SDE-2 operations will be controlled by a chilled water condenser (ID No. CD-4002) in series with a mineral oil scrubber (ID No. CD-4003-S). Avoca has elected to control HAP emissions by 95% by weight, as allowed as one of the compliance options under 40 CFR Part 63, Subpart FFFF for Group 1 batch process vents.

As shown in the detailed calculations in Appendix B of the permit application, uncontrolled emissions from process vents in the SDE-2 operations are estimated as 51.1 tons per year. VOC emissions not lost through vents are assumed to be lost via fugitives, and fugitive emissions of VOC are estimated as 351.8 tons per year (402.9 tons per year – 51.1 tons per year).

In accordance with 40 CFR 70.2, potential emission from SDE-2 operations must account for “any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment..., if the limitation is enforceable by the Administrator.” The VOC emissions of 51.1 tons per year from the process vents must be adjusted for controls required by 40 CFR Part 63, Subpart FFFF, to determine potential VOC emissions from the SDE-2 operations. Assuming a control efficiency of 95% by weight as required by the MACT, controlled emissions of VOC are estimated as 2.56 tons per year (51.1 tons per year emitted\*(1-0.95)). Therefore, potential VOC emissions from the SDE -2 operations, accounting for controls, are estimated as 354.4 tons per year (351.8 tons per year + 2.56 tons per year). The table below provides a summary of the VOC emissions.

<b>Emissions Source</b>	<b>Amount</b>	<b>Basis for emissions</b>
VOC Emissions from Process Vents	2.56 tons per year	Equations / methodology in 40 CFR 63.1257 and shown in Appendix B of the permit application.  Emissions were estimated assuming 95% control of VOC.
VOC emissions from fugitives	351.8 tons per year	Total uncontrolled VOC emissions – VOC emissions from process vents  402.9 tons per year – 51.1 tons per year
Potential VOC emissions from SDE-2 operations	354.4 tons per year	Fugitive emissions +VOC emissions after control  351.8 tons per year + 2.56 tons per year

Approximately 99.3% (351.8 tons per year) of the VOC were assumed to be lost via fugitive emission sources and 0.7% (2.56 tons per year) were assumed emitted from the process vents after controls.

### 3.0 Project Regulatory Review

#### 3.1 Regulations

The new SDE-2 operations will be subject to the following regulations.

- 15A NCAC 2D .0530, Prevention of Significant Deterioration – Because the facility is located in Bertie County, which is attainment for all NAAQS pollutants, the planned modification and its emissions are required to be assessed in light of PSD requirements. Avoca is a major stationary source for PSD purposes, and the emission increases as a result of this modification exceed the significance levels as listed in 40 CFR 51.166(b)(23)(i). Thus, the new SDE-2 operations are subject to BACT. As discussed in greater detail in Section 4, the BACT limit for the SDE-2 operations is 354.4 tons per year (tpy) of VOC (12-month running total).
- 15A NCAC 2D .0958, Work Practices for Sources of Volatile Organic Compounds – This regulation establishes work practice standards for sources that emit VOC. Because VOC are being used as a material processing media, the regulation is applicable to this facility.
- 15A NCAC 2D .1111, Maximum Achievable Control Technology – Avoca is a major source of hazardous air pollutants (HAPs), and the new SDE-2 operations uses n-hexane, which is a HAP. As specified in 40 CFR 63.2435(b)(2), facilities that are major for HAPs with miscellaneous chemical process units (MCPU) that process, use or generate organic HAPs are subject to “NESHAP for Miscellaneous Organic Chemical Manufacturing,” 40 CFR Part 63, Subpart FFFF, also referred to the “Miscellaneous Organic NESHAP” or MON. More discussion of MACT is contained in Section 3.2 below.
- 15A NCAC 2D .1806, Control and Prohibition of Odorous Emissions – This rule is state enforceable only and is applicable facility-wide. Under this regulation, no facility shall operate

without employing suitable measures for the control of odorous emissions. There is no history of odor complaints from the existing operations.

### 3.2 Miscellaneous Organic NESHAP

The existing SDE-1 operations and new SDE-2 operations at Avoca are subject to the MON. These operations are considered the same MCPU based on the “family of materials” defined in the MON. The new SDE-2 operations will be three times larger than the current SDE-1 operations, and the cost of this addition will exceed 50 percent of the fixed capital cost required to construct a comparable new source. The modified MCPU meets the definition of reconstruction under 40 CFR 63.2. As such, both SDE-1 operations and SDE-2 operations are considered new affected sources under 40 CFR 63.2440(c).

The batch vents, storage tanks, and wastewater operations in the SDE-1 process are currently classified as Group 2 sources. These designations will not change under this modification, and the SDE-1 process will continue to meet Group 2 requirements.

The batch process vents and the virgin hexane tank (ID No. T-4001) in the new SDE-2 operations are classified as Group 1 sources. The wastewater operations and other tanks in the new SDE-2 operations are classified as Group 2 sources. Emission limits and compliance options for the new SDE-2 operations under the MON are summarized in the table below.<sup>2</sup> The SDE-2 operations must be in compliance with the MON upon startup.

Emission Unit	Emission Limit/Work Practice Standard	How to comply
Batch Process Vents	<u>Table 2, Option (b) for batch vents:</u> Avoca will reduce collective uncontrolled organic HAP emissions from the sum of all batch process vents within the process by $\geq 95$ percent by weight by venting emissions from a sufficient number of the vents through a closed-vent system to a combination of recovery devices (e.g., a condenser and a mineral oil scrubber).	Avoca will meet the applicable requirements in 40 CFR 63.2460 including the following: <ul style="list-style-type: none"> <li>• Demonstrate initial compliance and establish operating limits via source tests.</li> <li>• Conduct testing under worst case conditions.</li> <li>• Use daily averaging.</li> <li>• Install a flow meter on the control device.</li> </ul> Periods of no flow will not be used in the daily averages.
Storage Tanks	<u>Virgin hexane tank (ID No. T-4001)</u> 17,900 gallons (67.8 m <sup>3</sup> ) with a vapor pressure of 13.6 kPa <u>Table 4, option (b)(ii)</u> Avoca will reduce collective uncontrolled organic HAP emissions from the sum of all batch process vents within the process by $\geq 95$ percent by weight by venting emissions from a sufficient number of the vents through a closed-vent system to a combination of recovery devices (e.g., a condenser and a mineral oil scrubber).	<u>Virgin hexane tank (ID No. T-4001)</u> The subject tank will be vented to condenser and MOS, and will meet the requirements under 40 CFR 63.2450(c) for combined emission streams. Specifically under 40 CFR 63.2450(c)(2)(i), emissions from the tank must meet the requirements of Table 2 and 40 CFR 63.2460 for Group 1 batch process vents, including applicable monitoring, recordkeeping, and reporting.

<sup>2</sup>The MON allows subject facility several options for compliance. Avoca intends to comply with the options as specified in the table.

<b>Emission Unit</b>	<b>Emission Limit/Work Practice Standard</b>	<b>How to comply</b>
Storage Tanks	<u>Other tanks in the SDE-2 operations</u>	<p><u>Other tanks in the SDE-2 operations</u> All other tanks are less than 10,000 gallons and do not meet the Group 1 status. As such they are Group 2 storage tanks and have no control requirements under the MON.</p> <p>Although not required by the MON, Avoca has elected to vent all storage tanks in the SDE-2 to the condenser and MOS.</p>
Equipment Leaks	Table 6 for any MCPU	Avoca will comply with requirements of 40 CFR Part 63, Subpart UU.
Wastewater in SDE-2	Table 7	<p><u>Process Wastewater streams</u> Avoca has determined the concentration of n-hexane in the wastewater streams to be less than 15 ppm for n-hexane, making them Group 2 wastewater streams. The only requirements for Group 2 process wastewater streams is recordkeeping and reporting.</p> <p><u>Maintenance Wastewater streams</u> Avoca will develop required maintenance procedures for these streams and incorporate the procedures into the facility's startup, shutdown, and malfunction plan.</p> <p><u>Liquid streams in an open system within an MCPU</u> Avoca does not have equipment in Table 35 of 40 CFR Part 60 Subpart G that meets the requirements of 40 CFR 63.149(e)(1) or (2). Therefore the liquid streams in the SDE operations require no controls.</p>
Heat exchangers	Table 10	Avoca will comply with requirements under 40 CFR 63.104 as applicable. Specifically, Avoca is currently complying with 40 CFR 63.104(b) and will continue to do so for the new SDE-2 operations.

Avoca will meet the monitoring, reporting, and recordkeeping requirements for the SDE-2 operations as discussed in detail in the permit application. The permit application serves as both the precompliance report under 40 CFR 63.2520(c), which must be submitted with the application for approval of construction, and the initial notification, as allowed under 40 CFR 63.9(b)(1)(iii).

Section 2.2.C.1 of the permit contains the MON requirements. This permit condition will be updated to include the SDE-2 operations. The equation for calculating organic HAP emissions from the SDE-1 operations to maintain its vents as Group 2 batch process vents under the MON was also updated. One other change to note is the removal of requirements for Group 2 batch process vents that emit hydrogen halides. Avoca does not emit any hydrogen halides, and this requirement is not applicable to the facility. The revised permit condition is provided in Attachment B1 of this permit review.

## 4.0 Prevention of Significant Deterioration

The basic goal of the PSD regulations is to ensure the air quality in clean (i.e. attainment) areas does not significantly deteriorate while maintaining a margin for future industrial growth. The PSD regulations focus on industrial facilities, both new and modified, that create large increases in the emission of certain pollutants. The EPA promulgated final regulations governing the PSD in the Federal Register published August 7, 1980. Effective March 25, 1982, the NCDAQ received full authority from the EPA to implement PSD regulations in the state.

### 4.1 PSD Applicability

Under PSD requirements all major new or modified stationary sources of air pollutants regulated and listed in this section of the Clean Air Act must be reviewed and approved prior to construction by the permitting authority. A major stationary source is defined as any one of 28 named source categories that has the potential to emit 100 tons per year of any regulated pollutant or any other stationary source that has the potential to emit 250 tons per year of any PSD regulated pollutant. Avoca is a chemical processing plant, which is one of the 28 listed source categories with major source thresholds of 100 tons per consecutive 12-month period, under 40 CFR 51.166 (b)(1)(i)(a). It is a major stationary source for PSD purposes. Therefore, the emission increases as a result of this modification must be compared to the significance levels as listed in 40 CFR 51.166 (b)(23)(i) to determine which pollutants must undergo a PSD review.

For this proposed modification, emissions of VOC exceed the SER of 40 tons per year. Other PSD regulated pollutants are not emitted as part of this modification. Thus, Avoca performed the following reviews and analysis related to PSD for VOC for this modification:

- A BACT determination, and
- An additional impacts analysis including effects on soils, vegetation, and visibility.

### 4.2 BACT Analysis

Under PSD regulations, the determination of the necessary emission control equipment is developed through a BACT review. BACT is defined, in pertinent part, by the Federal Register [40 CFR 51.166 (b)(12)] as:

*An emissions limitation... based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant.*

The BACT requirements are intended to ensure that the control systems incorporated in the design of the proposed facility reflect the latest control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the facility. Additionally, the BACT analysis may consider the impacts of non-criteria pollutants and unregulated toxic air pollutants, if any are emitted, when making the BACT decision for regulated pollutants. The pollutant subject to PSD review for the new SDE-2 operations at Avoca is VOC.

Each pollutant subject to a PSD review must meet the criteria of BACT, which refers to the maximum amount of emission reduction currently possible with respect to technical application and



economic, energy, and environmental considerations. Because equipment within categories of sources vary widely, it is difficult to establish a uniform BACT determination for a particular pollutant or source. Economics, energy, and environment in combination with the unique functions of the source and engineering design, require BACT to be determined on a case-by-case basis. In most instances BACT may be defined through an emission limitation. In cases where this is impossible, BACT can be defined by the use of a particular type of control device and its achievable emission reduction efficiency. In no event can a technology be recommended that would not comply with any applicable standard of performance established pursuant to section 111 or 112 of the Clean Air Act.

The BACT analysis performed for Avoca included five basic steps listed below:

- 1) Identify all control technologies,
- 2) Eliminate technically infeasible options,
- 3) Rank remaining control technologies by control efficiencies,
- 4) Evaluate the most effective controls and document results, and
- 5) Select BACT.

The first step in this approach is a comprehensive listing of control technologies for each applicable pollutant. Step two is a demonstration of technical feasibility to ensure the technology evaluated was appropriate for the characteristic gas stream to be treated. Step three ranks the remaining control technologies by control effectiveness, including the control efficiencies (percent of pollutant removed), expected emission rate (tons per year and pounds per hour), expected emission reduction (tons per year), economic impacts (cost effectiveness), environmental impacts (including emission of toxic or hazardous air contaminants), and energy impacts (benefits or disadvantages). Step four is a case-by-case evaluation of energy, environmental, and economic impacts. Step five requires the selection of BACT for the emission source. While the steps are similar to EPA's top-down process, unlike the EPA decision process, NCDAQ follows statutory mandate that economics, energy, and environmental impacts of candidate technologies be evaluated.

### **4.3.BACT Analysis for SDE Process Vents**

#### **4.3.1 Identify Control Technologies**

An investigation was performed to identify current regulatory BACT/LAER determinations for extraction operations. The search involved a review of EPA's RACT/BACT/LAER clearinghouse (RBLC), which included information on BACT and LAER decisions throughout the country. The search focused on several similar operations with BACT determinations within the last ten years. The following emission source categories in the RBLC were searched:

- Other Agricultural Manufacturing Sources (RBLC Code 61.999)
- Batch Reaction Vessels (RBLC Code 64.001)
- Process Vents (RBLC Code 64.003)
- Storage Tanks (RBLC Code 64.004)
- Other (RBLC Code 64.999)
- Other Chemical Manufacturing (RBLC Code 69.999)
- Food and Agricultural Production (RBLC Code 70.390)
- VOC with process containing "extraction."

The review of NSR permit data in the RBLC identified 55 decisions involving facilities meeting the search criteria noted previously. The primary types of controls identified as BACT in the RBLC search were mineral oil scrubbers, alone or with condensers (12); scrubbers or absorption, but not specifically mineral oil scrubbers, alone or with condensers (15); emission limits (10), and condensers alone (5). Carbon adsorption was identified as control in one draft decision in the RBLC results. Five decisions cited leak detection and repair (LDAR) as BACT for process leak. Three decisions were for nitrogen blankets (2) and a floating roof (1) on storage tanks. Four decisions involved fixed roofs for wastewater operations, one of which included a biological treatment system. Also, note that not all these controls were installed as a result of BACT or LAER requirements.

Based on an extensive search of RBLC results, as well as a review of relevant literature and knowledge of controls for similar industries, the following control technologies were considered in this BACT analysis for VOC control:

- Thermal Oxidation Systems
- Catalytic Oxidation Systems
- Adsorption Systems
- Absorption Systems
- Biofiltration Systems
- Condensation Systems.

#### **4.3.2 Eliminate Technically Infeasible Options**

##### Catalytic Oxidation/Thermal Catalytic Oxidation

In a catalytic oxidizer, a catalyst is used to lower the activation energy needed for oxidation. When a preheated gas stream is passed through a catalytic oxidizer, the catalyst bed initiates and promotes the oxidation of VOC without being permanently altered. In catalytic oxidation, combustion occurs at significantly lower temperatures than with thermal oxidation. However, care must be taken to ensure complete combustion.

A major disadvantage of catalytic oxidization is the high cost of fuel and catalyst replacement. Although catalytic oxidization requires less fuel than thermal oxidization at the same heat recovery rate, the catalyst replacement costs can be significant. In some cases, disposal of spent catalyst can also prove a difficult hurdle because of deposits of potentially hazardous substances.

Catalytic oxidation is not considered to be technically feasible in this situation. The SDE operations may contain chemical compounds that could poison/blind the catalyst. None of the process in the RBLC used this control technology.

##### Carbon Adsorption

Adsorption is a process where VOCs are removed from low to medium concentration gas streams. The gas molecules pass through a bed of solid particles such as activated carbon, which is the most widely used adsorbent. The molecules are held to the adsorbent by attractive forces that are weaker than chemical bonds.

One draft decision in the RBLC identified carbon adsorption as control on an extraction process. As shown in the results of the RBLC search, the extraction industry primarily uses condensers and mineral oil scrubbers as BACT. Carbon adsorption has been eliminated as a technology that has not been demonstrated in practice in the biological extraction industry.

#### Bio-oxidation / Biofiltration

Bio-filtration is an air pollution control technology in which VOCs are oxidized using living micro-organisms on a media bed (sometimes referred to as a bioreactor). As emissions flow through the bed media, pollutants are absorbed by moisture on the media and come into contact with the microbes. The microbes consume and metabolize the excess organic pollutants, converting them to carbon dioxide and water, much like a traditional oxidation process.

The efficacy of bio-oxidation and biofiltration to remove VOC emissions from the Avoca facility is unknown. A review of the RBLC search confirms no extraction processes using this control technology as BACT. Due to the undemonstrated nature of bio-oxidation/biofiltration in the biologic extraction industry, this technology has been eliminated from further consideration.

#### **4.3.3 Rank Remaining Control Technologies by Effectiveness**

The remaining control technologies were ranked from the most stringent to the least stringent, as shown in the table below.

<b>Control Technology</b>	<b>Approximate Control Efficiency (%)</b>
Regenerative Thermal Oxidation (RTO) + Condenser	98%
Mineral Oil Scrubber (Packed bed absorption) + condenser	98%
Condenser	65%

#### Thermal Oxidation (Regenerative)

In regenerative oxidation, the inlet gas stream is drawn through a hot ceramic or stoneware bed that preheats the gas stream prior to its entering the combustion chamber. The hot flue gas exits the oxidizer and passes into a second ceramic bed, which captures and stores thermal energy. When this bed has been heated sufficiently, the flow is switched so that the inlet gas is now redirected through the hot bed and the exhaust gas is passed through the now cool primary bed. By switching flows in this manner, high heat exchanger temperatures are maintained. Aside from the ceramic media heat exchanger, regenerative systems operate in the same manner as conventional thermal oxidization.

Regenerative oxidizers provide a high degree of thermal heat recovery and are useful for situations where the air flowrate is high and VOC concentration is low. In these cases, a significant amount of heat recovery is required to minimize overall system operating costs. Costs can be high because of the capital investments, and supplemental fuel along with other operating costs.

#### Mineral Oil Scrubber (Absorption)

Absorption systems, like the mineral oil scrubber, are used to control gas-phase VOC. The effectiveness of the absorption system will depend on the solubility of the pollutant in the liquid stream, the gas and liquid throughput rates, and the type of scrubber that is selected. The typical scrubber used for this type of operation is a mineral oil scrubber, as was confirmed by the search of the RBLC for extraction processes.

### Condensers

Condensers operate by separating volatile compounds in a vapor mixture from the remaining vapors by means of saturation followed by a phase change. Condensers are typically refrigerated to decrease the temperature to aid in saturation and therefore increase the removal efficiencies of the units. There are two common types of condensers used for VOC removal – surface and contact condensers. The coolant does not contact the gas stream in surface condensation; the vapor condenses as a film on the cooled surface and then discharges to a collection tank. Conversely, the vapor stream is sprayed with a liquid coolant in a contact condenser. The VOCs contained within the waste coolant often create a disposal problem because they cannot be recycled or separated from the stream without additional processing.

Because the condenser's removal efficiency is highly dependent on the characteristics of the waste gas stream, they are only feasible for removing certain compounds. Compounds with high boiling points and low volatility are more easily condensable than compounds with low boiling points and high volatility. EPA recommends, as a conservative starting point for considering condensers as a control, that the VOCs have boiling points above 100°F. N-hexane and isohexane have boiling points of 156°F and 140°F, respectively. Thus, condensers are technically feasible as a control option for the SDE-2 operations.

#### **4.3.4 Evaluate Technically Feasible Control Options**

A BACT analysis, consistent with the Clean Air Act, was performed on the add-on control technologies that were shown to be technically feasible.

### Assumptions Used in the BACT analysis

To perform the BACT analysis, it was necessary to make engineering judgments concerning the control efficiency of various add-on controls. The destruction efficiency of the RTO and condenser was estimated as 98%. The removal efficiencies of the mineral oil scrubber and condenser and the condenser alone were estimated as 98% and 65%, respectively.

Other assumptions used in performing this analysis are included in the detailed cost calculations presented in Appendix D of the permit application. All cost estimates were prepared using potential VOC emission rates for the new SDE-2 operations. Annual operational hours were assumed to be 8,760 per year.

### Cost Effectiveness

The cost impacts of controlling equipment emissions with add-on controls are presented in the table below. The estimated cost impacts were estimated using the Office of Air Quality Planning and Standards Control Cost Manual (CCM)<sup>3</sup>, past permitting experience, EPA Technology Fact Sheet for packed bed scrubbers, and vendor quotes for the condenser. All costs provided in the CCM were updated to 2014 dollars using Consumer Price Index Price Inflation calculator<sup>4</sup>.

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<sup>3</sup> Office of Air Quality Planning and Standards Cost Control Manual. Fourth Edition. EPA-450/3-90-006. Office of Air Quality Planning and Standards, Environmental Protection Agency, Research Triangle Park, North Carolina. January 1990.

<sup>4</sup> Consumer Price Index Calculator developed by the US Department of Labor Bureau of Labor Statistics.

<b>Add-On Control Technology</b>	<b>Baseline Emissions (tons/yr)</b>	<b>VOC Emissions Reduction (%)</b>	<b>VOC Emissions Reduction (tpy)</b>	<b>Total Capital Cost (2014 \$)</b>	<b>Total Annual Cost (\$/yr)</b>	<b>Cost - Effectiveness (\$/Ton)</b>
RTO and condenser	51.1	98%	48.5	\$620,162	\$271,105	\$5,585
Mineral Oil Scrubber and condenser	51.1	98%	48.5	\$594,401	\$230,533	\$4,749
Condenser only	51.1	65%	33.2	\$67,756	\$156,502	\$4,712
<b>Notes:</b> Avoca would not install a mineral oil scrubber or RTO alone but would install a combination of condenser and mineral oil scrubber or RTO. The cost for the RTO and the mineral oil scrubber do not include the cost of the condenser. Even excluding the condenser, these control devices are not cost effective.						

#### Energy and Environmental Impacts

Although each of the potentially feasible add-on control devices evaluated provides reductions in VOC emissions, the devices also have associated negative energy and/or environmental impacts. The energy and secondary environmental impacts are presented in the table below for each add-on control alternative. In the case of thermal oxidization, the combustion of natural gas would result in small quantities of combustion pollutants: nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>2</sub>), particulate matter (PM), carbon monoxide (CO), and VOCs. Emission factors from EPA's AP-42 document are used to calculate these emissions.

<b>Control Technology</b>	<b>Emissions (tpy)</b>					<b>Energy Impacts</b>
	<b>NO<sub>x</sub></b>	<b>SO<sub>2</sub></b>	<b>PM</b>	<b>CO</b>	<b>VOC</b>	<b>Electricity Increase over Baseline (MW-hr/yr)</b>
RTO and condenser	0.04	0.0003	0.003	0.04	0.002	0.683
Mineral Oil Scrubber and condenser	--	--	--	--	--	0.683
Condenser only	--	--	--	--	--	70.1
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Emissions from the RTO were determined from DAQ's spreadsheet entitled, "Natural Gas Combustion Calculator Revision K" (06/19/2012), operating at 8,760 hours per year.</li> <li>• EPA's AP-42, Section 1.4 (7/98).</li> <li>• Natural gas requirements were based on vendor specifications.</li> <li>• Natural gas fuel content was assumed to be 1,020 Btu/scfm.</li> </ul>						

#### **4.3.5 Select BACT for Process Vents**

The definition of BACT in the Clean Air Act (CAA) states, "In no event shall application of 'best available control technology' result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard established pursuant to section 111 or 112 of this Act." (Section 169 of the CAA). Because 40 CFR Part 63 standards were established pursuant to 112(d) of the CAA, the emission reductions resulting from the MON must be accounted for in the proposed BACT limit. Otherwise, the proposed BACT limit conflicts with the definition of BACT under the CAA. BACT for the process vents are the post controlled VOC emissions of 2.56 tons per year, based on a 95% control efficiency required by the MON. Although not cost effective under the BACT analysis, a condenser and mineral oil scrubber will be installed on the new SDE-2 operations to comply with the MON requirements.

#### **4.4 VOC BACT Analysis for Process Fugitives**

Equipment leaks and other fugitive emissions from the SDE-2 operations are quantifiable based on a material balance of the solvents (n-hexane and isohexane) used in the process. The fugitive emissions occur at various locations or points (e.g., pumps, valves, flanges, opening reactors and dryers, etc.) throughout the new SDE-2 operation, and the facility indicates that these emissions cannot be easily controlled. The SDE-2 operations are subject to the Leak Detection and Repair (LDAR) requirements under the MON. Avoca will comply with 40 CFR Part 63, Subpart UU, as required for process fugitives under the MON.

#### **4.5 Wastewater**

In a 2004 PSD permit application, Avoca proposed BACT to be fixed roof tanks for the process wastewater tanks associated with the Rotocel, Recovery, Biomass Extraction, and Botanical Extraction operations. These same tanks will be used for SDE wastewater. Avoca will continue to comply with the 2004 BACT for wastewater tanks by using fixed roof tanks for all its wastewater operations.

#### **4.6 Overall BACT Limit**

Avoca is requesting a BACT limit for the SDE-2 operations of 354.4 tons per 12-month period. Because VOC emissions from the new SDE-2 operations are predominately fugitive emissions (99.3%), there is no practical approaches for setting a short term BACT limit. The most practical approach for assessing compliance is to continue to conduct a monthly solvent material balance to assess compliance with the BACT limit.

#### **4.7.PSD Air Quality Impact Analysis**

PSD regulations [40 CFR 51.166(k)] require an applicant to perform an ambient impact analysis to demonstrate, 1) that no NAAQS will be exceeded at any location and during any time period where the proposed new source or modification will have significant impact; and 2) that the proposed new source or modification, in combination with other increment-affecting sources, will not cause any allowable PSD increment to be exceeded. PSD regulation 40 CFR 51.166(m) requires analysis of ambient air quality in the impact area of the proposed source or modification for all pollutants (including those for which no NAAQS exist) with emissions increases in significant [40 CFR 51.166(b)(23)] quantities.

##### Potential Emissions

VOC emissions are considered precursors to ozone formation. PSD regulations [40 CFR 51.166(i)] state that an ambient impact analysis of ozone, including the gathering of ambient air quality data, could be required if the net VOC emission increase is greater than 100 tpy. Previous and ongoing regional air dispersion modeling efforts to determine ozone attainment within the North Carolina air shed have shown that VOC emissions at the level stated above will not contribute, by itself, to significant ozone formation. No additional monitoring or modeling is required for this pollutant.

##### Non-Regulated Pollutant Impact Analysis

The new SDE-2 operations, which are subject to 40 CFR Part 63, Subpart FFFF, as noted previously, emit the toxic air pollutants (TAPs), n-hexane and isohexane. As specified in 15A NCAC 2Q .0702(a)(27)(B), any air emission source subject to an applicable requirement under 40 CFR Part 63

is exempt from NC air toxics. However, the DAQ must ensure that the permit modification does not present “an unacceptable risk to human health,” in accordance with G.S. 143-215. 107(b) as codified on May 1, 2014.

Avoca conducted its most recent air modeling in 2013 to remove requirements for NC Air toxics from the permit. The modeling analysis was reviewed by Tom Anderson of the Air Quality Analysis Branch of the NCDAQ. According to Mr. Anderson’s memorandum dated May 16, 2013, the modeling demonstrated compliance on a source-by-source basis with the NC Acceptable Ambient Level (AAL) found in 15A NCAC 02D .1100.

To determine if the addition of the SDE-2 operations to the permit pose an unacceptable risk to human health, emissions of n-hexane and isohexane used in the 2013 air modeling were compared with potential emissions from this modification. The Rotocel/Recovery data used in previous modeling analyses was based on usage of 40% n-hexane and 60% isohexane. The facility no longer uses this mixture and now utilizes a 5% n-hexane and 95% isohexane. This change and decreased emissions from the recently modified SFG operations were included in the NC air toxics analysis for the SDE-2 operations. The results of the emission comparison are shown in the table below. The overall potential emissions of n-hexane decreased by 19.3% and emissions of isohexane emissions decreased by 2.4% when compared with the emissions used in the 2013 modeling. Therefore, the addition of the new SDE-2 operations does not present an unacceptable risk to human health.

<b>Comparison of Facility-Wide Emissions</b>					
<b>Pollutant</b>	<b>Averaging Period</b>	<b>Emissions Used in 2013 Air Modeling</b>		<b>Emissions after Modifications</b>	
		<b>Facility-wide emissions (lb/hr)</b>	<b>% of AAL</b>	<b>Facility-wide Emissions (lb/hr)</b>	<b>% Decrease in Emissions</b>
n-hexane	24-hour	117.4	92%	94.7	19.3%
Isohexane	1-hour	1707.3	19%	1666.8	2.4%
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Potential emissions of n-hexane from the new SDE-2 operations are estimated as 32.4 lb/hr, and potential emissions of isohexane were estimated as 48.5 lb/hr. The emissions take into account the control efficiency of the condenser and mineral oil scrubber used on process vents in the SDE-2 operations.</li> <li>• Emissions of n-hexane from the SFG operations used in the 2013 modeling were 11.6 lb/hr. Emissions of isohexane were 421.5 lb/hr. Only heptane is now used in the SFG operations, and n-hexane and isohexane are no longer emitted from the SFG operations.</li> <li>• For the existing Rotocel/Recovery Operations, emissions of n-hexane will decrease by 43.2 lb/hr due to a change in the n-hexane to isohexane ratio used in the Rotocel/Recovery operations. Emissions of isohexane will increase by 334.0 pounds/hr when compared to the emissions used in the 2013 air modeling.</li> <li>• Emissions of n-hexane and isohexane from all other sources at Avoca remain the same as used in the 2013 modeling.</li> </ul>					

#### SER Analysis

As noted previously, VOC emissions from this project are above the SER for PSD. Potential emissions for all other PSD pollutants remain unchanged after the addition of the new SDE-2 operations and are therefore not subject to PSD review.

#### **4.8.Additional Impact Analysis**

PSD regulations [40 CFR 51.166(k)] also require a discussion of additional impacts and evaluation of potential impacts at Class I areas. The additional impact analysis generally has four parts as follows:

- Visibility impairment
- Growth
- Soils impacts, and
- Vegetation impacts.

Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. The nearest Class I area is Swanquarter National Wilderness Area, which is located approximately 68 km southeast of the facility.

#### **4.8.1 Visibility Impairment**

Visibility impairment is primarily a function of PM and NO<sub>x</sub> emissions. Avoca is not subject to PSD review for any pollutants other than VOC, and emissions of PM and NO<sub>x</sub> are not changing as a result of the proposed modification. Because there are no significant increases of visibility-affecting pollutants, no analysis of visibility impairment is required for this project.

#### **4.8.2 Growth Analysis**

The growth analysis includes the projection of the associated industrial, commercial and residential source emissions that will occur in the area due to modification of the source. The evaluation looked at the local work force increase and assessed secondary emission sources that potentially will build in the area to support the Avoca facility.

Approximately 100 people are currently employed by the Avoca facility. Avoca does not anticipate that the number of employees will increase due to the proposed modification.

Employment for Bertie County was obtained from the NC Department of Commerce. The data indicates an average unemployment rate of 10.5% (1,008 people). If Avoca needs to increase employment due to this modification, workers are expected to come from the existing labor pool. No new support services or suppliers are expected to locate in the area as a result of this project. Thus, the impact of economic growth associated with the proposed project will be negligible.

#### **4.8.3 Soils and Vegetation**

The only potential impact on soils and vegetation resulting from the proposed project would be on long term damage associated with the elevated ozone levels. The effects of ozone on vegetation are well documented. Symptoms of ozone damage include reduction in growth rates, reduction in reproductive rates, direct foliar damage, and mortality.

VOCs are regulated because they can be a precursor to ozone formation. In addition to VOCs, an important component of ozone formation is the ambient concentration of NO<sub>x</sub>. Studies have shown that ozone formation in the southeast is NO<sub>x</sub> limited, meaning that ozone formation is limited by the amount of NO<sub>x</sub> in the atmosphere rather than the amount of VOCs. Because this project will increase the amount of VOCs emitted rather than NO<sub>x</sub>, it is unlikely to significantly impact the amount ozone formed and, consequently, it will not adversely affect vegetation in the surrounding area.



#### **4.8.4 Class I Impact Analysis**

PSD Class I impact analyses contain evaluations of Air Quality Related Values (AQRV) and PSD increment were applicable. AQRV are typically defined as visibility (both near-field plume impairment and/or regional haze) and acidic deposition. As previously discussed, there will be no significance increases of any visibility-affecting pollutants as a result of this modification. Thus, no visibility analysis is warranted. There are also no significant increases of any deposition-related pollutants (SO<sub>2</sub> or NO<sub>x</sub>) expected as result of this modification. Therefore, no deposition analysis is required. Finally, there are no modeling related standards for VOCs (e.g. NAAQS or PSD increments). Therefore, no Class I or Class II area dispersion modeling analyses are required for this permit modification.

#### **4.9 Public Participation Requirements**

In accordance with 40 CFR 51.166(q), Public participation, the reviewing authority (NCDAQ) shall meet the following:

- 1) Make a preliminary determination whether construction should be approved, approved with conditions, or disapproved.

This document satisfies this requirement providing a preliminary determination that construction should be approved consistent with the permit conditions described herein.

- 2) Make available in at least one location in each region in which the proposed source would be constructed a copy of all materials the applicant submitted, a copy of the preliminary determination, and a copy or summary of other materials, if any, considered in making the preliminary determination.

This preliminary determination, application, and draft permit will be made available in the Washington Regional Office and in the Raleigh Central Office, with the addresses provided below.

Washington Regional Office  
943 Washington Square Mall  
Washington, NC 27889

Raleigh Central Office  
217 West Jones Street  
Raleigh, NC 27603

In addition, the preliminary determination and draft permit will be made available on the NCDAQ public notice webpage.

- 3) Notify the public, by advertisement in a newspaper of general circulation in each region in which the proposed source would be constructed, of the application, the preliminary determination, the degree of increment consumption that is expected from the source or modification, and of the opportunity for comment at a public hearing as well as written public comment.

The NCDAQ prepared a public notice (See Appendix A) that will be published in a newspaper of general circulation in the region.

- 4) Send a copy of the notice of public comment to the applicant, the Administrator and to officials and agencies having cognizance over the location where the proposed construction would occur as follows: Any other State or local air pollution control agencies, the chief executives of the city

and county where the source would be located; any comprehensive regional land use planning agency, and any State, Federal Land Manager, or Indian Governing body whose lands may be affected by emissions from the source or modification.

The NCDAQ will send the public notice (see Appendix A) to the Town Administrator of Windsor at PO Box 508, 106 Dundee Street Windsor, NC 27983 and the Bertie County Manager at PO Box 530, 106 Dundee Street, Windsor, NC 27983.

- 5) Provide opportunity for a public hearing for interested persons to appear and submit written or oral comments on the air quality impact of the source, alternatives to it, the control technology required, and other appropriate considerations.

The NCDAQ public notice (See Appendix A) provides contact information to allow interested persons to submit comments and/or request a public hearing.

## **5.0 Other Issues**

### **5.1 Compliance**

NCDAQ has reviewed the compliance status of this facility. The most recent inspection was completed during three site visits on December 3, 4, and 9, 2015. Betsy Huddleston of the WaRO indicated that the facility appeared to be in compliance with all applicable requirements. Additionally, a signed Title V Compliance Certification (Form E5) indicating that the facility was in compliance with all applicable requirements was included with the permit application, received on January 13, 2016. Avoca also submitted a revised Annual Compliance Certification (ACC) with minor administrative changes on February 29, 2016.

The following is the five-year compliance history for the facility.

- A Notice of Violation/Notice of Recommendation for Enforcement (NOV/NRE) was issued on October 31, 2012 for a failed particulate stack test. The biomass boilers had exceeded the particulate matter standard under 40 CFR Part 63, Subpart DDDDD. A civil penalty in the amount of \$4,549, including costs, was issued on February 14, 2013. The civil penalty was paid in full on March 22, 2013.
- A Notice of Deficiency (NOD) was issued on March 5, 2014 because the downtime of the oxygen analyzer and steam meter on boilers (ID Nos. ES-BB1 and ES-BB2) exceeded the allowable thresholds established per requirements under 40 CFR 63, Subpart DDDDD.

Both NOV/NRE and NOD have been resolved.

### **5.2 Zoning Requirements**

The area in which Avoca is located does not have zoning. As such, a notice was placed in the local paper and a sign has been placed in front of the facility as required pursuant to 15A NCAC 2Q .0113. The facility provided an affidavit and proof of publication of the legal notice as part of the permit application.

### **5.3 Professional Engineer's Seal**

A Professional Engineer's seal was included with the application. Dana W. Norvell, a Professional Engineer, who is currently registered in the State of North Carolina, sealed the application for the portions containing the engineering plans, calculations, and all supporting documentation.

### **5.4 Application Fee**

An application fee in the amount of \$14,359.00 was received.

### **5.5 CAA Section 112(r)**

The facility is not subject to Section 112(r) of the Clean Air Act requirements because it does not store any of the regulated substances in quantities above the thresholds in 112(r). This permit modification does not affect the 112(r) status of the facility.

### **6.0 Conclusion**

Based on the application submitted and the review of this proposal by the NCDAQ, the NCDAQ is making a preliminary determination that the project can be approved and a revised permit issued. After consideration of all comments a final determination will be made.

## **Attachment A1**

Revised Permit Condition for 40 CFR Part 63, Subpart FFFF

### **C. Sclareolide (SDE-1) Operations, including:**

- Eleven (11) process tanks of various capacities (ID No. ES-1001-1-3-P);
- One centrifuge (ID No. G-17);
- One steam-heated dryer with process condenser (ID No. D-1202);
- Filters (ID No. ES-1001-1-3-Filters);
- SDE-1 process equipment leaks (ID No. ES-1001-3-F); and
- SDE-1 wastewater stream (ID No. ES-1001-1-3-WW)

### **Sclareolide (SDE-2) Operations, including:**

- A chilled water condenser (ID No. CD-4002) in series with a mineral oil scrubber (ID No. CD-4003-S) controlling emissions from the following:
  - One 17,900 gallon virgin solvent tank (ID No. T-4001);
  - Two 6,000 gallon process tanks (ID Nos. T-4017 and T-4018);
  - One 4,200 gallon reactor with process condenser (EX-4001) (ID No. R-4004);
  - One 4,200 gallon reactor with process condenser (EX-4002) (ID No. R-4005);
  - One 4,200 gallon reactor with process condenser (EX-4003) (ID No. R-4044);
  - One 1,500 gallon reactor (ID No. R-4015); and
  - One centrifuge (ID No. C-4001)
- One dryer with process condenser (EX-4004) (ID No. D-4001) associated with a control condenser (ID No. CD-4001), in series with a chilled water condenser (ID No. CD-4002) in series with a mineral oil scrubber (ID No. CD-4003-S);
- SDE-2 process equipment leaks (ID No. ES-4000-F); and
- SDE-2 process wastewater stream (ID No. ES-4000-WW)

### **Ethyl Vanillin Glucoside (EVG) Operations, including:**

- One water spray fume scrubber (0.5 gallon per minute minimum water injection rate; ID No. CD-Z-9215) venting to one water spray fume scrubber (0.5 gallon per minute minimum water injection rate; ID No. CD-Z-9216) controlling emissions from the following:
  - Three reactors (ID Nos. D-2202, D-1215, and D-1218); and
  - One steam-heated dryer (ID No. D-1201);
- Process equipment leaks (ID No. ES-1003-2-2-F); and
- EVG Operations wastewater stream (ID No. ES-1003-2-2-WW)

**Plant Nutrient Extraction (PNE) Operations, including one water spray fume scrubber (0.5 gallon per minute minimum water injection rate; ID No. CD-Z-9215) venting to one water spray fume scrubber (0.5 gallon per minute minimum water solution injection rate; ID No. CD-Z-9216) controlling emissions from the following:**

- One product extract reactor (ID No. D31214) and one associated chilled water condenser (ID No. EX2203);
- Seven processing tanks of various capacities (ID No. ES-1003-2-1-P);
- One centrifuge (ID No. C-31203);
- One dryer equipped with a process condenser (ID No. D-1002);
- One process solvent tank (ID No. ES-TK-PNE-1)
- Process equipment leaks (ID No. ES-1003-2-1-F);
- One waste solids separator vessel (1,333 gallon capacity; ID No. D31211) and one associated chilled water condenser (ID No. EX2205); and
- PNE Process wastewater stream (ID No. ES-1003-2-1-WW)

**Concrete Operations, including:**

- Four steam-heated hot boxes (ID Nos. HB-1, HB-2, HB-3, and HB-4);
- Process equipment leaks (ID No. ES-1001-1-2-F);
- Six process tanks of various capacities (ID No. ES-1001-1-2-P) and one associated chilled water condenser (ID No. CD-1001-1-2); and
- Concrete Operations wastewater stream (ID No. ES-1001-1-2-WW)

**Rotocel Operations, as described in Section 2.1 C, above;**

**Two Storage and Recycle Tanks (ID No. ES-M-125A and M-125B)**

**Recovery Operations, as described in Section 2.1 C, above;**

**Biomass Extraction Operations, as described in Section 2.1 D, above;**

**Botanical Extraction Operations, as described in Section 2.1 D, above; and**

**Wastewater Treatment Plant Aeration Tank No. 1 (63,500 gallon capacity; ID No. WWTP-AT1)**

The following table provides a summary of limits and standards for the emission source(s) describe above:

Regulated Pollutant	Limits/Standards	Applicable Regulation
Hazardous Air Pollutants (HAP)	Maximum Achievable Control Technology	15A NCAC 02D .1111 (40 CFR Part 63, Subpart FFFF)

1. 15A NCAC 02D .1111 “MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY”

[40 CFR Part 63, Subpart FFFF]

- a. The Permittee shall comply with all applicable provisions, including the notification, testing, recordkeeping, monitoring, and reporting requirements contained in Environmental Management Commission Standard 15A NCAC 02D .1111 "Maximum Achievable Control Technology" as promulgated in 40 CFR Part 63, Subpart FFFF, “NESHAP for Miscellaneous Organic Chemical Manufacturing,” including Subpart A “General Provisions.”

**Definitions and Nomenclature** [40 CFR 63.2550]

- b. For the purpose of this permit condition, the definitions and nomenclature contained in 40 CFR 63.2550 shall apply.

**40 CFR Part 63, Subpart A General Provisions** [40 CFR 63.2540]

- c. The Permittee shall comply with the requirements of 40 CFR Part 63, Subpart A, “General Provisions,” as specified in Table 12 to 40 CFR Part 63, Subpart FFFF.

**Compliance Date** [40 CFR 63.2445(a), 40 CFR 63.56(b)]

- d. The Permittee shall be in compliance with the requirements of 40 CFR Part 63, Subpart FFFF for the SDE-2 operations upon startup. [40 CFR 63.2445(a)(2)]

**Notifications** [40 CFR 63.2515, 40 CFR 63.2520]

- e. The Permittee shall submit a notification of intent to conduct a performance test at least 60 calendar days before the performance test is scheduled to begin as required in 40 CFR 63.7(b)(1). For any performance test required as part of the initial compliance procedures for batch process vents in Table 2 of 40 CFR Subpart FFFF, the Permittee shall also submit the test plan required by 40 CFR 63.7(c) and the emission profile with the notification of the performance test. [40 CFR 63.2515(c)]

- f. The Permittee shall submit a Notification of Compliance Status (NOCS) Report for the SDE-2 operations no later than 150 days after startup. The NOCS must include the following information, as applicable:
  - i. The results of any applicability determinations, emission calculations, or analyses used to identify and quantify HAP usage or HAP emissions from the affected source.
  - ii. The results of emissions profiles, performance tests, engineering analyses, design evaluations, inspections and repairs, and calculations used to demonstrate initial compliance according to 40 CFR 63.2445 through 63.2485. For performance tests, results must include descriptions of sampling and analysis procedures and quality assurance procedures.
  - iii. Descriptions of monitoring devices, monitoring frequencies, and the operating limits established during the initial compliance demonstrations, including data and calculations to support the established levels.
  - iv. All operating scenarios.
  - v. Descriptions of worst-case operating and/or testing conditions for control devices.
  - vi. The information specified in 40 CFR 63.1039(a)(1) through (3) for each process subject to the work practice standards for equipment leaks in Table 6 to 40 CFR Part 63, Subpart FFFF. [40 CFR 63.985(c)(1), 40 CFR 63.2520(d)]
- g. The Permittee must submit a NOCS Report for the Concrete Operations, the Biomass Extraction Operations, and/or the PNE Operations prior to the operation of those operations in organic HAP service (as defined at 40 CFR 63.2250) and such that provisions of 40 CFR Part 63, Subpart FFFF apply to those operations, pursuant to 40 CFR 63.2520(d). The NOCS must include the information referenced above in Section 2.2.C.1.f, as applicable.
- h. The Permittee shall notify DAQ at least 60 days before operating Group 2 batch process vents as Group 1 batch process vents in accordance with 40 CFR 63.2460(b)(6)(ii) and 40 CFR 63.2520(e)(10)(ii).
- i. The Permittee shall be deemed in noncompliance with 15A NCAC 02D .1111 if the notification requirements in Sections 2.2.C.1.e through h are not met.

**General Compliance Requirements** [40 CFR 63.2450, 40 CFR 63.2445]

- j. The Permittee shall be in compliance with the emission limits and work practice standards in Tables 1 through 7 to 40 CFR Part 63, Subpart FFFF at all times, except during periods of startup, shutdown, and malfunction. [40 CFR 63.2450(a)]
- k. The Permittee shall comply with the applicable control requirements found in 40 CFR 63.2455 through 63.2490 for the affected sources. [40 CFR 63.2450(a)]
- l. Opening a safety device, as defined in 63.2550, is allowed at any time conditions require it to avoid unsafe conditions. [40 CFR 63.2450(p)]
- m. If a Group 2 emission point becomes a Group 1 emission point, the Permittee shall be in compliance with the Group 1 requirements beginning on the date the switch occurs. An initial compliance demonstration as specified in 40 CFR Part 63, Subpart FFFF must be conducted within 150 days after the switch in group status occurs. [40 CFR 63.2445(d)]
- n. The Permittee shall develop a written startup, shutdown, and malfunction plan (SSM Plan) that complies with 40 CFR 63.6(e) for the affected sources. The Permittee is not, however, required to address equipment leaks (except for control devices) or Group 2 emission points in the SSM Plan. The SSM Plan must describe, in detail, procedures for operating and maintaining the affected sources during periods of startup, shutdown, and malfunction; and corrective actions for malfunctioning process, control, and monitoring equipment used to comply with Subpart FFFF. The SSM Plan does not need to address any scenario that would not cause an affected source to exceed an applicable emission limit in Subpart FFFF. The SSM Plan must be maintained on site and made available for inspection by authorized personnel. [40 CFR 63.6(e)(3) and 63.2525(j)]
- o. The Permittee shall be deemed in non-compliance with 15A NCAC 02D .1111 if the requirements in Sections 2.2 C.1.j through n, above are not met.

**Emission Limits** [15A NCAC 02Q .0508(f), 40 CFR 63.2450, 40 CFR 63.2460, Table 2]

- p. The Permittee has elected to combine organic HAP emissions from different emission types in the SDE-2 operations (e.g., storage tanks and batch process vents). In accordance with 40 CFR 63.2450(c)(2)(i), the Permittee shall comply with the requirements for Group 1 batch process vents in Table 2 of 40 CFR Part 63, Subpart FFFF and 40 CFR 63.2460 for the combined streams, including applicable monitoring, recordkeeping, and reporting.
- q. In accordance with Table 2 of 40 CFR Part 63, Subpart FFFF, the Permittee shall reduce collective uncontrolled organic HAP emissions from the sum of all vents within SDE-2 operations by  $\geq 95$  percent by weight by venting emissions from a sufficient number of the vents through one or more closed-vent systems to the chilled water condenser (**ID No. CD-4002**) in series with the mineral oil scrubber (**ID No. CD-4003-S**) (recovery devices as defined in 40 CFR 63.2550(i)). [40 CFR 63.2450(c)(2)(i), 40 CFR 63.2460(a), Table 2 (1)(a) in 40 CFR Part 63, Subpart FFFF]

**Testing** [15A NCAC 02Q .0508(f), 40 CFR 63.2460]

- r. The Permittee shall conduct a performance test to demonstrate initial compliance with the emission limit in Section 2.2.C.1.q within 150 days of initial startup of the SDE-2 operations. The Permittee shall conduct the testing under worst-case conditions. The testing shall be performed in accordance with 40 CFR 63.2460(c)(2), 40 CFR 63.997,<sup>1</sup> 15A NCAC 02D .2601, and General Condition JJ. If the results of this test are above the emission limits as specified in Section 2.2.C.1.q above, the Permittee shall be deemed in noncompliance with 15A NCAC 02D .1111.
- s. The Permittee shall establish operating limits for the chilled water condenser (**ID No. CD-4002**) in series with the mineral oil scrubber (**ID No. CD-4003-S**) in accordance with 40 CFR 63.2460(c)(3) within 150 days of initial startup of the SDE-2 operations. The operating limits shall be established under the conditions required for the initial compliance demonstration. If the Permittee fails to establish operating limits in accordance with these requirements, the Permittee shall be deemed in noncompliance with 15A NCAC 02D .1111.

**Monitoring Requirements** [15A NCAC 02Q .0508(f), 40 CFR 63.2460]

- t. The Permittee shall comply with the specific requirements of Sections 2.2 C.1.t.i through vii, below:
  - i. **Continuous process vents:** To ensure compliance, the Permittee shall perform the monitoring of Sections 2.2 C.1. t.i(A) and (B), below, for the affected continuous process vents:
    - (A) For the continuous process vents associated with the Rotocel Operations and the Recovery Operations, the Permittee shall perform the monitoring found in Sections 2.2 B.1.g through j, above.
    - (B) For continuous process vent associated with the Botanical Extraction Operations, the Permittee shall perform the monitoring found in Sections 2.2 B.1.g and h, above.
  - ii. **Group 1 batch process vents:** To ensure compliance, the Permittee shall perform the following monitoring for the process vents and storage tanks (i.e., combined process streams) in the SDE-2 operations:
    - (A) The Permittee shall monitor the mineral oil scrubber temperature and specific gravity of the mineral oil. Each monitoring device shall be capable of providing a continuous record. [40 CFR 63.990(c)(1)]
    - (B) The Permittee shall monitor the condenser exit temperature using a monitoring device capable of providing a continuous record. [40 CFR 63.990(c)(2)]
    - (C) Because flow to the chilled water condenser (**ID No. CD-4002**) in series with the mineral oil scrubber (**ID No. CD-4003-S**) could be intermittent, the Permittee shall install, calibrate, and operate a flow indicator at the inlet or outlet of the control device to identify periods of no flow. Periods of no flow may not be used in daily averages or in fulfilling a minimum data availability requirement [40 CFR 63.2460(c)(7)]

<sup>1</sup> With the exceptions specified in 40 CFR 63.2450(g)(1)-(5).

(D) Upon DAQ's approval of the operating limits for the chilled water condenser (**ID No. CD-4002**) and mineral oil scrubber (**ID No. CD-4003-S**), the Permittee shall attach the approval memorandum to this permit and shall maintain the parameters within the associated operating limits contained therein.

iii. **Group 2 batch process vents:** To ensure compliance, the Permittee shall perform the monitoring of Sections 2.2 C.1.t.iii(A) and (B), below, for the affected batch process vents:

(A) For the batch process vents associated the EVG Operations and SDE-1 operations, the Permittee shall comply with the requirements of 40 CFR 63.2460. To maintain Group 2 classification for these emission sources, the organic HAP emissions must be less than 10,000 pounds per consecutive 365-day period, each source. The Permittee shall monitor the organic HAP emissions from each of these emission sources, monthly, as follows:

(1) Organic HAP emissions from the EVG Operations shall calculated using the following equation:

$$OrganicHAP = \left[ 1.0 \left( \frac{pounds}{batch} \right) \times B \right]$$

Where: B = The number of batches processed in the EVG Operations

(2) Organic HAP emissions from the SDE-1 operations shall calculated using the following equation:

$$OrganicHAP = \left[ 2.27 \left( \frac{pounds}{tankfill} \right) \times B_{tf} \right] + \left[ 4.80 \left( \frac{pounds}{batch} \right) \times B_{reg} \right] + \left[ 3.66 \left( \frac{pounds}{batch} \right) \times B_{rec} \right] + \left[ 4.19 \left( \frac{pounds}{batch} \right) \times B_{tc} \right]$$

Where: B<sub>reg</sub> = The number of regular batches processed in the SDE-1 Operations; and

B<sub>rec</sub> = The number of recrop batches processed in the SDE-1 Operations

B<sub>tc</sub> = The number of third crop batches processed in the SDE-1 Operations; and

B<sub>tf</sub> = The number of hexane tank (M-2) fills.

(B) Upon DAQ's approval of revised organic HAP emission factors cited in the equations in Sections 2.2 C.1.t.iii(A)(1) and (2), above, the Permittee shall attach the approval memorandum to this permit and shall use the revised emission factors in calculating the organic HAP emissions from the EVG Operations and the SDE-1 Operations.

iv. **Storage tanks (except those associated with the SDE-2 operations):** For the storage tanks that are part of the affected source, the Permittee shall comply with the requirements of 40 CFR 63.2470 and Table 4 of 40 CFR Part 63, Subpart FFFF.

v. **Equipment leaks:** For the process equipment leaks from the affected sources, the Permittee shall comply with the requirements of 40 CFR 63.2480 and Table 6 of 40 CFR Part 63, Subpart FFFF. The Permittee shall comply with the monitoring requirements of the leak detection and repair (LDAR) program found in Section 2.2 B.2, above, for the equipment associated with the affected sources.

vi. **Wastewater streams:** For the wastewater streams associated with the affected miscellaneous organic chemical manufacturing processes (MCPU), the Permittee shall comply with the requirements of 40 CFR 63.2485 and Table 7 of 40 CFR Part 63, Subpart FFFF, including:

(A) Identifying any operations that may generate maintenance wastewater and the procedures for properly managing that maintenance wastewater in the SSM Plan developed for this Avoca, Inc. facility [40 CFR 63.105]; and

(B) Maintaining the conditions necessary for classification of the process wastewater from the affected sources as Group 2, unless the conditions of Section 2.2 C.1.m, above, have been met.

vii. **Heat exchangers:** For the heat exchangers associated with the affected sources, the Permittee shall comply with the requirements of 40 CFR 63.2490 and Table 10 of Subpart FFFF, including:



- (A) Preparation and implementation of a monitoring plan that documents the procedures that will be used to detect leaks of process fluids into cooling water. This plan shall require monitoring of one or more surrogate indicators (e.g., pH, conductivity, etc.) or monitoring of one or more process parameters or other conditions that indicate a leak. The plan shall include the following:
    - (1) A description of the parameter or condition to be monitored and an explanation of how the selected parameter or condition will reliably indicate the presence of a leak;
    - (2) The parameter level(s) or conditions(s) that shall constitute a leak. This shall be documented by data or calculations showing that the selected levels or conditions will reliably identify leaks. The monitoring must be sufficiently sensitive to determine the range of parameter levels or conditions when the system is not leaking. When the selected parameter level or condition is outside that range, a leak is indicated;
    - (3) The monitoring frequency which shall be no less frequent than monthly for the first 6 months and quarterly thereafter to detect leaks;
    - (4) The records that will be maintained to document compliance with the requirements of 40 CFR 63.104.
  - (B) If a substantial leak is identified by methods other than those described in the heat exchanger monitoring plan and the method(s) specified in the plan could not detect the leak, the Permittee shall revise the plan and document the basis for the changes no later than 180 days after discovery of the leak.
  - (C) The Permittee shall maintain a copy of the heat exchanger monitoring plan on-site. If the monitoring plan is superseded, retain the most recent superseded plan at least until 5 years from the date of its creation.
  - (D) If a leak is detected in any heat exchanger system, it shall be repaired as soon as practical but not later than 45 calendar days after the Permittee receives results of monitoring tests indicating a leak, unless the Permittee demonstrates that the results are due to a condition other than a leak. Once the leak has been repaired, the owner or operator shall confirm that the heat exchange system has been repaired within 7 calendar days of the repair or startup, whichever is later, except where the Permittee appropriately applies the delay of repair provisions found in Section 2.2 C.1.t.vii.(E), below.
  - (E) Delay of repair of heat exchange systems is allowed if the equipment is isolated from the process. Delay of repair is also allowed if repair is technically infeasible without a shutdown and any one of the conditions listed in 40 CFR 63.104(e)(1) through (2) is met.
- [40 CFR 63.2490, 40 CFR 63.104]
- The Permittee shall be deemed in non-compliance with 15A NCAC 02D .1111 if the Permittee does not meet the requirements of Sections 2.2 C.1.t.i through vii, above.

**Recordkeeping Requirements** [15A NCAC 02Q .0508(f)]

- u. The Permittee shall comply with the following requirements:
  - i. Create and retain a record of each time a safety device is opened to avoid unsafe conditions.
  - ii. Create and retain the following records on each affected MCPU:
    - (A) A description of the process and the type of process equipment used;
    - (B) An identification of related process vents (including associated emissions episodes), wastewater points of determination (PODs), and storage tanks;
    - (C) The applicable control requirements pursuant to 40 CFR Part 63, Subpart FFFF, including the level of required control, and for vents, the level of control for each vent;
    - (D) The control device or treatment process used, as applicable, including a description of operating and/or testing conditions for any associated control device;
    - (E) The process vents, wastewater POD, transfer racks, and storage tanks (including those from other processes) that are simultaneously routed to the control device or treatment process;
    - (F) The applicable monitoring requirements of this subpart and any parametric level that

- ensures compliance for all emissions routed to the control device or treatment process; and,  
(G) Calculations and engineering analyses required to demonstrate compliance.  
[40 CFR 63.2525(b)]
- iii. Create and retain a schedule or log of operating scenarios for the batch operations updated each time a different operating scenario is put into effect. [40 CFR 63.2525(c)]
  - iv. For each affected MPCU with a Group 1 batch process vent (i.e., combined process streams in the SDE-2 Operations), the Permittee shall keep records of daily averages of each continuously monitored parameter specified in Section 2.2.C.1.t.ii, above. The Permittee shall calculate and/or maintain records of the following:
    - (A) The Permittee shall maintain records of values as specified in 40 CFR 63.998(b)(1);
    - (B) Except as specified in Section 2.2.C.1.u.iv.(E) below, daily average values of each continuously monitored parameter shall be calculated from data meeting the specifications of 40 CFR 63.998(b)(2) for each operating day and retained for 5 years.
    - (C) The daily averages shall be calculated as the average of all values for a monitored parameter recorded during the operating day. The average shall cover a 24-hour period if operation is continuous, or the period of operation per operating day if operation is not continuous. If values are measured more frequently than once per minute, a single value for each minute may be used to calculate the daily average instead of all measured values. [40 CFR 63.998(b)(3)]
    - (D) Periods of no flow may not be used in daily averages, and they may not be used in fulfilling a minimum data availability requirement. [40 CFR 63.2460(c)(7)]
    - (E) The Permittee shall not exclude monitoring data during periods of startup, shutdown, and malfunction. [40 CFR 63.2450(l)]
    - (F) Actual concentration for supplemental gases must be corrected using Equation 1 of 40 CFR Part 63, Subpart FFFF. [40 CFR 63.2460(c)(6)]
    - (G) The operating day shall be the period defined in the operating permit or in the NOCS. It may be from midnight to midnight or another daily period. [40 CFR 63.988(b)(3)]
    - (H) If all recorded values for a monitored parameter during an operating day are within the limits established in the NOCS or in the operating permit, the Permittee may record that all values were within the range and retain this record for 5 years rather than calculating and recording a daily average. [40 CFR 63.998(b)(3)]
    - (I) The Permittee shall maintain records of the results of each continuous parameter monitoring system calibration check and the maintenance performed, as specified in 40 CFR 63.2450(k)(1).
- [40 CFR 63.2450, 40 CFR 63.2525, 40 CFR 63.998(b)(1) through (3)]
- v. For each affected MPCU with a Group 2 batch process vent, the Permittee shall retain the following records:
    - (A) A record of the day each batch was completed;
    - (B) A record of whether each batch operated was considered a standard batch;
    - (C) The estimated uncontrolled and controlled emissions for each batch that is considered to be a non-standard batch; and
    - (D) Records of the daily 365-day rolling summations of emissions, or alternative records that correlate to the emissions (e.g., number of batches), calculated no less frequently than monthly.
- [40 CFR 63.2525(e)]
- vi. For the process equipment leaks from the affected sources, the Permittee shall retain each applicable record required by 40 CFR Part 63, Subpart UU. The Permittee shall comply with the recordkeeping requirements of the LDAR program found in Sections 2.2 B.2.ii. through jj, above, for the equipment associated with the affected sources. [40 CFR 63.2525(a)]
  - vii. For each affected Group 2 wastewater stream, the Permittee shall retain the following records:
    - (A) MPCU identification and description;
    - (B) Stream identification code;

(C) Concentration of compounds listed in Table 8 and Table 9 of 40 CFR Part 63, Subpart FFFF (in ppmw), including documentation of the methodology used to determine concentration; and,

(D) Stream flow rate (in liters/min).

[40 CFR 63.147(b)(8)]

viii. For each affected heat exchanger system, the Permittee shall retain the following records:

(A) Monitoring data indicating a leak, the date when the leak was detected, and if demonstrated not to be a leak, the basis for that determination;

(B) Records of any leaks detected by procedures other than those provided in the written heat exchanger monitoring plan, including the date the leak was discovered;

(C) The dates of efforts to repair leaks; and,

(D) The method or procedure used to confirm repair of a leak and the date repair was confirmed.

[40 CFR 63.104(f)(1)]

The Permittee shall be deemed in non-compliance with 15A NCAC 02D .1111 if the Permittee does not meet the requirements of Sections 2.2 C.1.u.i through viii, above.

**Reporting** [15A NCAC 02Q .0508(f), 40 CFR 63.2520]

v. **Advanced Notification of a Process Change.** The Permittee shall submit a report 60 days before the scheduled implementation date of any of the changes identified below:

i. Any change to the information contained in the precompliance report.

ii. A change in the status of a control device from small to large.

iii. A change from Group 2 to Group 1 for any emission point except for batch process vents batch process vents that meet the conditions specified in 40 CFR 63.2460(b)(6)(i).

[40 CFR 63.2520(e)(10)]

w. The Permittee shall submit a semiannual compliance report, acceptable to the Regional Air Quality Supervisor, of monitoring and recordkeeping activities postmarked or delivered on or before January 30 of each calendar year for the preceding six-month period between July and December, and July 30 of each calendar year for the preceding six-month period between January and June. The report shall contain the following:

i. Company name and address.

ii. Statement by a responsible official with that official's name, title, and signature, certifying the accuracy of the content of the report.

iii. Date of report and beginning and ending dates of the reporting period.

iv. If there are no deviations from any emission limit, operating limit or work practice standard specified in this subpart, include a statement that there were no deviations from the emission limits, operating limits, or work practice standards during the reporting period.

v. For each deviation from an emission limit, operating limit, and work practice standard, include the following information:

(A) The total operating time of the affected source during the reporting period; and,

(B) Information on the number, duration, and cause of deviations (including unknown cause, if applicable), as applicable, and the corrective action taken.

vi. Identification each new operating scenario which has been operated since the time period covered by the last compliance report and has not been submitted in the previous compliance report. For the purposes of this paragraph, a revised operating scenario for an existing process is considered to be a new operating scenario.

vii. For the equipment listed below, report in a summary format by equipment type, the number of components for which leaks were detected and for valves, pumps and connectors show the percent leakers, and the total number of components monitored. Also include the number of leaking components that were not repaired as required, and for valves and connectors, identify the number of components that are determined to be non-repairable as described in 40 CFR 63.1025(c)(3).

- (A) Valves in gas and vapor service and in light liquid service;
  - (B) Pumps in light liquid service;
  - (C) Connectors in gas and vapor service and in light liquid service; and,
  - (D) Agitators in gas and vapor service and in light liquid service.
- viii. Where any delay of repair for leaks is utilized, report that delay of repair has occurred and report the number of instances of delay of repair.
- ix. For pressure relief devices, report the results of all leak monitoring to show compliance conducted within the semiannual reporting period.
- x. Report, if applicable, the initiation of a monthly leak monitoring program for valves.
- xi. For each affected heat exchanger system for which the Permittee invokes the delay of repair, include the following information:
- (A) The presence of the leak and the date that the leak was detected.
  - (B) Whether or not the leak has been repaired.
  - (C) The reason(s) for delay of repair.
  - (D) If the leak is repaired, the owner or operator shall report the date the leak was successfully repaired.
  - (E) If the leak remains unrepaired, the expected date of repair.
- [40 CFR 63.104(f)(2)]

**ATTACHMENT B1**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Permit Issue Date: 01/12/2016**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Betsy Huddleston  
**Date of Last Inspection:** 12/09/2015  
**Compliance Code:** 3 / Compliance - inspection

<b>Facility Data</b>  <b>Applicant (Facility's Name):</b> Avoca Incorporated  <b>Facility Address:</b> Avoca Incorporated 841 Avoca Farm Road Merry Hill, NC 27957  <b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing  <b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V						<b>Permit Applicability (this application only)</b>  <b>SIP:</b> 2D .0530, 2D .0535, 2D .0958, 2D .1806 <b>NSPS:</b> N/A <b>NESHAP:</b> N/A <b>PSD:</b> BACT limit for VOC only <b>PSD Avoidance:</b> N/A <b>NC Toxics:</b> N/A <b>112(r):</b> N/A <b>Other:</b> N/A	
<b>Contact Data</b>						<b>Application Data</b>	
<b>Facility Contact</b>  Brian Conner Environmental Health & Safety Manager (252) 482-2133 PO Box 129 Merry Hill, NC 27957		<b>Authorized Contact</b>  David Peele Owner / President (252) 482-2133 PO Box 129 Merry Hill, NC 27957		<b>Technical Contact</b>  Samuel Tynch Director of Operations/Engineering (252) 482-2133 PO Box 129 Merry Hill, NC 27957		<b>Application Number:</b> 0800044.15A <b>Date Received:</b> 09/04/2015 <b>Application Type:</b> Modification <b>Application Schedule:</b> PSD  <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 01819/T44 <b>Existing Permit Issue Date:</b> 03/10/2015 <b>Existing Permit Expiration Date:</b> 07/31/2015	
<b>Total Actual emissions in TONS/YEAR:</b>							
CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2014	7.34	30.22	1021.10	21.19	0.4600	305.52	195.85 [Methanol (methyl alcohol)]
2013	11.85	27.84	1055.94	18.70	0.4600	250.74	155.43 [Methanol (methyl alcohol)]
2012	13.64	24.08	931.29	43.64	0.4430	214.72	145.25 [Methanol (methyl alcohol)]
2011	17.06	13.79	491.30	2.79	0.6600	123.95	68.53 [Methanol (methyl alcohol)]
2010	13.60	9.07	231.31	1.90	0.4200	67.49	52.54 [Hexane, n-]
<b>Review Engineer:</b> Betty Gatano  <b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____					<b>Comments / Recommendations:</b> Issue 01819/T45 <b>Permit Issue Date:</b> 01/12/2016 <b>Permit Expiration Date:</b> 12/31/2015		

## **1. Introduction**

NC Division of Air Quality (DAQ) is processing this application in accordance with 15A NCAC 2Q .0501(d)(1), satisfying the permitting requirements in both 15A NCAC 2D .0530, "Prevention of Significant Deterioration," (PSD) and 15A NCAC 2Q .0500, "Title V Procedures."

Pursuant to 40 CFR 51.166(q), "Public Participation, the DAQ has completed the following activities:

- (a) Published a "Public Notice on Preliminary Determination Regarding Approval of an Application Submitted under the Regulations Prevention of Significant Deterioration" in the November 24, 2015 edition of The Roanoke-Chowan News Herald, Ahoskie, NC.
- (b) Sent a copy of the public notice to Allen Castelloe, Town Administrator, Windsor, Bertie, County, NC.
- (c) Sent a copy of the preliminary determination, draft permit, and public notice to the applicant.
- (d) Sent a copy of the application, preliminary determination, draft permit, and public notice to the EPA Region 4.
- (e) Sent a copy of the application, preliminary determination, draft permit, and public notice to the DAQ Washington Regional Office.
- (f) Placed a copy of the preliminary determination, public notice, and draft permit at the DAQ website at <http://daq.state.nc.us/>

The above public notice complied with the public comment provision in the PSD regulation and provided for a 30-day period for submitting written comments on this project. The comment period expired on December 24, 2015.

The above public notice also complied with the public comment provisions and the EPA review requirements in 15A NCAC 2Q .0500, "Title V Procedures." The 30-day public comment period expired on December 24, 2015, and EPA's 45-day review period expired on January 8, 2016.

With respect to Class I areas, the nearest Class I area is Swanquarter National Wilderness Area, which is located approximately 68 km southeast of the facility. Tom Anderson of the DAQ emailed the US Forest Service (USDA) and US Fish and Wildlife Service (USDOI) on August 25, 2015 and inquired of their interest in this application review. Melanie Pitrolo of the US Forest Service responded via e-mail on August 25, 2015 and indicated no additional information about the project was needed. Jill Webster of the Fish and Wildlife Service responded via e-mail on August 26, 2015 indicated no additional information about the project was needed.

## **2. Public Comments**

No public comments were received.

## **3. EPA Comments**

No comments from EPA Region 4 were received.

## **4. NCDENR DAQ Regional Office Comments**

DAQ did not receive any comments from the Washington Regional Office on the publicly noticed version of the draft permit.

#### **5. Company Comments**

DAQ did not receive any comments from the applicant during the 30-day comment period.

#### **6. DAQ Recommendations**

DAQ recommends issuing the FINAL air permit for the project consisting of expanding the Sclareol Recrystallization Operations at the Avoca Incorporated facility located in Merry Hill, Bertie County, North Carolina.

**Attachment B2**  
**Preliminary Determination and Air Permit Review**



**ATTACHMENT B2 – Preliminary Review**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Preliminary Review Draft: 11/20/2015**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Betsy Huddleston  
**Date of Last Inspection:** 01/15/2015  
**Compliance Code:** 3 / Compliance - inspection

<p align="center"><b>Facility Data</b></p> <p><b>Applicant (Facility's Name):</b> Avoca Incorporated</p> <p><b>Facility Address:</b>          Avoca Incorporated          841 Avoca Farm Road          Merry Hill, NC 27957</p> <p><b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec  <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing</p> <p><b>Facility Classification: Before:</b> Title V <b>After:</b> Title V  <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V</p>	<p align="center"><b>Permit Applicability (this application only)</b></p> <p><b>SIP:</b> 2D .0530, 2D .0535, 2D .0958, 2D .1806  <b>NSPS:</b> N/A  <b>NESHAP:</b> N/A  <b>PSD:</b> BACT limit for VOC only  <b>PSD Avoidance:</b> N/A  <b>NC Toxics:</b> N/A  <b>112(r):</b> N/A  <b>Other:</b> N/A</p>
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Contact Data			Application Data
<p align="center"><b>Facility Contact</b></p> <p>Brian Conner          Environmental Health &amp;          Safety Manager          (252) 482-2133          PO Box 129          Merry Hill, NC 27957</p>	<p align="center"><b>Authorized Contact</b></p> <p>David Peele          Owner / President          (252) 482-2133          PO Box 129          Merry Hill, NC 27957</p>	<p align="center"><b>Technical Contact</b></p> <p>Samuel Tynch          Director of          Operations/Engineering          (252) 482-2133          PO Box 129          Merry Hill, NC 27957</p>	<p><b>Application Number:</b> 0800044.15A  <b>Date Received:</b> 09/04/2015  <b>Application Type:</b> Modification  <b>Application Schedule:</b> PSD</p> <p align="center"><b>Existing Permit Data</b></p> <p><b>Existing Permit Number:</b> 01819/T44  <b>Existing Permit Issue Date:</b> 03/10/2015  <b>Existing Permit Expiration Date:</b> 07/31/2015</p>

Total Actual emissions in TONS/YEAR:							
CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
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2012	13.64	24.08	931.29	43.64	0.4430	214.72	145.25 [Methanol (methyl alcohol)]
2011	17.06	13.79	491.30	2.79	0.6600	123.95	68.53 [Methanol (methyl alcohol)]
2010	13.60	9.07	231.31	1.90	0.4200	67.49	52.54 [Hexane, n-]
2009	16.94	11.33	309.15	2.37	0.5200	49.16	26.74 [Hexane, n-]

<p><b>Review Engineer:</b> Betty Gatano</p> <p><b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____</p>	<p align="center"><b>Comments / Recommendations:</b></p> <p>Issue 01819/T45  <b>Permit Issue Date:</b> 01/12/16  <b>Permit Expiration Date:</b> 12/31/2015</p>
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## **1.0 Introduction and Purpose of Application**

### **1.1 Facility Description & Proposed Change**

Avoca Incorporated (Avoca) currently holds Title V Permit No. 01819T44 with an expiration date of July 31, 2015 for a chemical extraction facility in Merry Hill, Bertie County, North Carolina. The facility extracts oils and nutrients from various types of plants for use in flavorants, fragrances, food additives, and dietary supplements. The main product at the facility is sclareol/sclareolide. Sclareol is extracted from clary sage grown on farms surrounding the Avoca facility. The extracted material is converted to sclareolide offsite and purified at the Merry Hill facility. Sclareolide is the final product and is used to maintain fragrance potency in perfumes, laundry detergents, and a variety of other products.

There are four processes involved in producing sclareolide – Rotocel, Recovery, Sclareol Recrystallization Operations (SFG), and Sclareolide Operations (SDE).

In the first process, clary sage is augured to a belt that carries it to an extractor called the Rotocel. Hexane isomer is added to the extractor to strip out sclareol from the sage. Spent sage from the Rotocel is sent to a desolventizer, which drains the hexane from the sage. Volatilized hexane is condensed and collected in the solvent separation/recovery tank. Condensed water and hexane separate in this tank (hexane floats), and the recovered hexane is stored in two recycle process tanks. The sage exiting the desolventizer is hot and contains a significant amount of hexane. Most of the hexane flashes fugitively to the atmosphere when the sage is removed from the desolventizer.

The sclareol/hexane material leaving the Rotocel process is sent to the Recovery process. In this step, hexane from the sclareol/hexane mixture is flashed off in the stripper, and the sclareol is mixed in a receiving tank with methanol to further strip out hexane. The resulting purified oil settles to the bottom of the tank and is drawn into buckets. The Recovery process can produce up to 100 cans sclareol oil/day (47 lbs/can), but Avoca is currently producing approximately 85 cans/day.

The sclareol buckets are carried to the SFG (sclareol recrystallization) process, where the sclareol oil is crystallized into a white powder. The SFG operations consist of a series of tanks, two reactors, a centrifuge, and a dryer. The sclareol and heptane are fed to a reactor, and the crystallized material is sent to a centrifuge and dryer. Heptane recovered from the first pass is sent to a second reactor to recover any additional sclareol. As before, the crystallized material is sent to the centrifuge and dryer. The sclareol comes out of the dryer as a white powder. Heptane recovered from the second reactor is again reprocessed to recover any remaining heptane. The residual material remaining after the final heptane recovery is a waste by-product.

The powder is bagged and shipped to an Avoca plant in Wisconsin, where the material is converted from sclareol to sclareolide by yeast (i.e., biological conversion). The sclareolide returns to the Merry Hill facility as a white powder, which is purified in the Sclareolide Operations (SDE). The powder is placed in a tank with water and iso-hexane (40% n-hexane). The mixture is processed through reactors, a centrifuge, and a dryer. The final, purified sclareolide remains a white powder.

#### PSD Project

A permit application for a modification under 15A NCAC 2D .0530, “Prevention of Significant Deterioration” (PSD), was received on September 4, 2015. Avoca is proposing to expand the SFG

operations. The capacity of the SFG operations will be tripled under the proposed project. The following equipment will be added to the facility under the SFG expansion:

- One 12,500 gallon storage tank (ID No. T-3006)
- One 12,500 gallon process tank (ID No. T-3007)
- Two reactors (ID Nos. R-3003 and R-3004) with process condensers (ID Nos. EX-3004 and ES-3005)
- One centrifuge (ID No. C-3002)
- One dryer with (ID No. D-3002) with process condenser (ID No. ES-3006) and a chilled water control condenser (ID No. CD-3002)
- Optional controls – chilled water control condenser (ID No. CD-3003) and mineral oil scrubber (ID No. CD-3004-S).

The optional condenser and mineral oil-scrubber are to be installed on the vents from all (new and existing) storage tanks, reactors, centrifuges, and dryers in the SFG operations. The intent of adding these control devices is to recover as much heptane as possible for reuse in the operations. As optional control devices, their removal efficiencies are not considered when calculating emissions from the SFG operations.

The proposed project will increase VOC emissions by more than the PSD significant emission rate (SER) of 40 tons per year. Thus, the proposed project is subject to review and processing under 15A NCAC 2D .0530, PSD. The facility must also comply with other specific NCDAQ air pollution regulations where applicable.

In accordance with PSD requirements, Avoca has conducted a Best Available Control Technology (BACT) analysis, additional impacts (soils, vegetation, visibility) analysis, and to the extent necessary, Class I area analysis.

Avoca also submitted an application for a permit renewal on October 31, 2014, or at least nine months prior to the expiration date of July 31, 2015. Therefore, the application shield as specified under 15A NCAC 2Q .0512(b) remains in effect. Because the renewed permit has not yet been issued, the expiration date will be changed to [REVISED DATE] under this permit modification. A footnote also will be added to the permit stating, “This permit shall expire on the earlier of [REVISED DATE] or the date the renewal of Air Permit No. 01819T44 has been issued or denied.”

## 1.2 Plant Location

Avoca is located at 841 Avoca Farm Road, Merry Hill, North Carolina, which is in eastern Bertie County. Bertie County has been classified as in attainment for all pollutants subject to a National Ambient Air Quality Standard (NAAQS).

## 1.3 Permitting History Since Issuance of Title V Permit Renewal

Permit	Issue Date	Description
01819T37	August 17, 2010	TV permit renewal issued with an expiration date of July 31, 2015.
01819T38	June 3, 2011	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2) for the addition of the following: <ul style="list-style-type: none"><li>• two new biomass/bio-based solids-fired boilers (18.6 million Btu per hour maximum heat input, ID Nos. ES-BB1 and ES-</li></ul>

Permit	Issue Date	Description
		BB2) controlled by a cyclone (144 inches in diameter, ID No. CD-BB1C) in series with a dry lime injected bagfilter (8,900 square feet of filter area, ID No. CD-BB1BH), and <ul style="list-style-type: none"> <li>• one No. 2 fuel oil-fired rotary dryer (6.0 million Btu per hour maximum heat input, ID No. ES-RD).</li> </ul>
--	--	“Part 2” permit application for the new biomass/bio-based solids-fired boilers (ID Nos. ES-BB1 and ES-BB2) received on October 9, 2012. The permit application will be consolidated with the application for TV permit renewal.
01819T39	January 4, 2013	The air permit was reopened for cause to correct specific condition (2.1 E.7.) pertaining to MACT Subpart DDDDD for two biomass boilers (ID Nos. ES-BB1 and BB2). The condition contained an incorrect compliance date and was corrected under the permit modification.
01819T40	June 6, 2013	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2) to modify the SFG operations by replacing the current dryer with a new larger capacity dryer (ID No. D-3001). A new larger reactor (ID No. R-3002) equipped with a process condenser (ID No. EX-3003) was also added under this modification. The smaller reactor (ID No. R-3001) was to be used as a secondary reactor after modification.
01819T41	November 26, 2013	Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2). The following changes were made under the permit modification. <ul style="list-style-type: none"> <li>• Updated CO and NOx emission factors for the biomass boilers (ID Nos. ES-BB1 and BB2). Stack testing performed on December 6, 2011 while firing wood showed measured emission factors of 0.068 lb/MMBtu for NOx and 0.0008 lb/MMBtu for CO.</li> <li>• Replaced the existing six MMBtu/hr burner on the rotary dryer with a 30 MMBtu/hr burner and added propane as a fuel.</li> <li>• Updated the maximum burner rating of the two (2) biomass boilers. The boilers heat input rating was increased from the permitted 18.6 MMBtu/hour each to a maximum heat input to 24 MMBtu/hour each.</li> <li>• Limited VOC emissions from the rotary dryer to less than 40 tpy to avoid triggering PSD requirements.</li> <li>• Limited n-hexane from the rotary dryer to less than 10 tons per year to avoid being subject to the 112(g) requirements listed in 15A NCAC 2D .1112.</li> <li>• Clarified the operating configuration of the sage drying system.</li> </ul>

Permit	Issue Date	Description
01819T42	January 27, 2014	<p>Air permit processed as a minor modification with the following changes:</p> <ul style="list-style-type: none"> <li>• Replaced two underground storage tanks (ID No. ES-1001-2-1-P2) with two above ground storage tanks (20,000 gallons capacity each, ID Nos. ES-M-125A and 125B).</li> <li>• Added a new storage tank associated with the Plant Nutrient Extraction (PNE) operations (9,500 gallons capacity, ID No. ES-TK-PNE-1).</li> <li>• Added a sage briquette making machine (ID No. I-Briquette) with enclosed conveyors.</li> <li>• Added a molecular sieve (ID No. MSDU-1024) as part of the description for the Biomass Extraction operations (which was added to Air Permit No. 01819T41).</li> <li>• Included existing diesel emergency generator (401 horsepower, ID No. E104) to the permit.</li> </ul>
--	--	<p>“Part 2” permit application for changes to the SFG operations and modifications to boilers (ID Nos. ES-BB1 and BB2) and rotary dryer (ID No. ES-RD) received on May 30, 2014. The permit application will be consolidated with the application for TV permit renewal.</p>
--	--	<p>Permit application for renewal of the Title V permit was received on October 31, 2014.</p>
01819T43	December 19, 2014	<p>Air permit processed as a minor modification with the following changes:</p> <ul style="list-style-type: none"> <li>• Updated capacity of above ground storage tanks (ID Nos. ES-M-125A and 125B) to 19,500 gallons.</li> <li>• Added a condenser (ID No. CD-3002) to the existing dryer (ID No. D-3001) in the SFG operations.</li> </ul>
01819T44	March 10, 2015	<p>Air permit processed as significant modification under a 15A NCAC 2Q .0501(c)(2), which was consolidated with a minor modification. The following changes were made under the permit modification.</p> <ul style="list-style-type: none"> <li>• Added a new dryer equipped with chilled water condenser and distillate tank (ID No. D-1002) after the centrifuge (ID No. C-1203) in the PNE operations.</li> <li>• Removed a underground ethanol storage process tank from the PNE operations (ID No. TK-9214).</li> <li>• Modified conditions to indicate the scrubbers are not required to operate during PNE and EVG operations.</li> <li>• Re-evaluated the operating temperature limit for the cryogenic condensers in the Botanical/Biomass Extraction Operations.</li> </ul>

## 1.4 Application Chronology

Date	Event
August 21, 2015	Pre-application meeting between NCDAQ and Avoca occurred.
August 25, 2015	Tom Anderson of the Air Quality Analysis Branch of NCDAQ e-mailed personnel from US Forest Service, the Fish and Wildlife Services, and the National Park Service informing them of the project and the potential VOC emissions expected.
August 25, 2015	Melanie Pitrolo of the US Forestry Service sent an e-mail to Tom Anderson indicating that no additional information was needed for this project.
August 26, 2015	Jill Webster of the Fish and Wildlife Service sent an e-mail to Tom Anderson indicating that no additional information was needed for this project.
September 4, 2015	PSD permit application received.
September 9, 2015	A permit application acknowledgment letter was issued.
September 16, 2015	Betty Gatano issued a letter to Avoca indicating that the PSD application was deemed complete.
October 20, 2015	Draft permit and permit review sent for internal review.
October 28, 2015	Mark Cuilla provided comments on the draft permit and permit review.
October 30, 2015	Draft permit and permit review sent to Dana Norvell, consultant for the facility.
November 9, 2015	Dana Norvell provided comments on the draft permit and permit review.
November 24, 2015	Draft permit and permit review sent to public notice.

## 2.0 Modified Emission Sources and Emissions Estimates

The SFG operations are an intermittent batch process for producing a refined high purity sclareol. In the SFG operations, sclareol oil from the Recovery process is mixed with high purity heptane, centrifuged, and dried to higher purity powder for further processing offsite. Heptane is used in the SFG operations to dissolve the sclareol, and ethyl acetate is added to control the rate of crystallization. The SFG operations are composed of the following four steps:

- Virgin solvent tank fills
- Treater batch
- Recrop batch, and
- Third crop batch.

The primary batch or treater batch is the initial processing step, where sclareol is extracted (dissolved) with heptane, centrifuged, and dried. The recovered heptane from the treater batch is called “Mother liquor” and is reprocessed in the recrop batch to extract any remaining sclareol. As before, the sclareol is centrifuged and dried as product. Heptane recovered from the recrop batch is again reprocessed in the third crop batch. This final step is intended to recover heptane only and not to obtain product. The residual material remaining after heptane recovery is a sludge. It is not dried and is considered a waste by-product.

The expanded SFG operations will use a series of storage tanks, four reactors, two centrifuges, and two dryers to recrystallize the sclareol into powdered form. The specific equipment in the SFG operations after modification are the following:

- One process tank (6,700 gallon capacity) (ID No. T-3001)
- Four process tanks (2,500 gallons capacity each) (ID Nos. T-3002 through T-3005)

- Reactor No. 1 equipped with two chilled water process condensers (EX-3001 and EX-3002) (ID No. R-3001) with control chilled water condenser (ID No. CD-3001)
- Reactor No. 2 equipped with a chilled water process condenser (EX-3003) (ID No. R-3002)
- Centrifuge (ID No. C-3001)
- Steam-heated dryer equipped with a chilled water process condenser (EX-3002) (ID No. D-3001) with control chilled water condenser (ID No. CD-3001)
- One storage tank (12,500 gallons) (ID No. T-3006)
- One process tank (12,500 gallons) (ID No. T-3007)
- Reactor No. 3 equipped with a chilled water process condenser (EX-3004) (ID No. R-3001)
- Reactor No. 4 equipped with a chilled water process condenser (EX-3005) (ID No. R-3002)
- Centrifuge (ID No. C-3002)
- Steam-heated dryer equipped with a chilled water process condenser (EX-3006) (ID No. D-3002) with control chilled water condenser (ID No. CD-3002).

All these emission sources may be controlled with optional control devices consisting of a chilled water condenser (ID No. CD-3003) in series with a mineral oil scrubber (ID No. CD-3004-S).

Avoca tracks the usage of heptane and ethyl acetate and reports solvent used as solvent lost to determine monthly emissions (i.e., a mass balance based on usage). The facility determined the maximum actual usage data and prorated this amount to the maximum potential operations to determine potential VOC emissions from the expanded process.

The maximum VOC usage occurred in March 2015 and was 5.31 tons of VOC per month. This value was increased by a factor of 3.41 to account for maximum production in the expanded operation. The increased factor was estimated by dividing the desired production after modification by the current production. In other words, the desired production after modification was shown to be 3.41 times the maximum production levels. Finally, the resulting value was multiplied by 12 months to arrive at potential VOC emissions after expansion. The potential VOC emissions are calculated as shown in the following equation:

$$\text{Potential VOC emissions} = 5.31 \text{ tons/month} * 3.41 * 12 \text{ months/year} = 217.4 \text{ tons VOC/year}$$

The maximum usage of VOC reported in March 2015 is less than historic monthly VOC usage in the SFG operations. Prior to November 2014, Avoca used n-hexane and hexane isomers in the SFG operations rather than the heptane that is currently being used. When Avoca began using heptane as a solvent in the SFG operations, the VOC usage (and resultant emissions) was substantially less as compared to hexane loss. Thus, basing the VOC emissions on the previous hexane emissions would not be reflective of the current operations at the facility.

This potential emission estimate of 217.4 tons per year represents the total amount of VOC lost from the SFG operations and accounts for both losses through point sources and fugitive emission sources. The point sources are the process vents associated with the equipment in the SFG operations. Fugitive emissions are those emissions that cannot reasonably pass through a stack, chimney, vent or other functionally equivalent opening. Thus, fugitive emissions include not only emissions from equipment leaks (pumps, flanges, valves etc.) but emissions from other areas throughout the SFG operations that are not vented through a stack. The latter category includes but is not limited to the following sources of fugitive emissions:



- Emissions are lost when reactor R-3002 is opened for charging the wax (sclareol) and heptane into the reactor (prep step).
- A pot is ahead of the vacuum pump that drains into a 55 gallon drum. This stream contains heptane and is a possible fugitive emission source.
- An insoluble layer is formed in the reactor vessel after the water wash. Avoca drains off the top layer into a trench drain inside the process building. This layer will contain some heptane in the liquid form. Although this water is sent to the wastewater treatment plant (WWTP), the majority of the heptane in the stream evaporates prior to reaching the WWTP, thus creating a fugitive emissions area source.
- The centrifuge is equipped with a “knife” to scrape the material from the sides of the vessel however it is not able to reach all of the material. Avoca must open the centrifuge on a regular basis to manually scrape the vessel. Some heptane could be released during the opening of the centrifuge.
- Avoca samples the batch during the crystallization step by draining the material into a 5 gallon pail and then returns the material to the vessel. Some VOC’s will be emitted from this pail during sampling because it is opened to the atmosphere.

Potential emissions lost from process vents (points sources) were calculated from emission equations and methodology in “NESHAP for Pharmaceuticals Production,” 40 CFR Part 63, Subpart GGG (40 CFR 63.1257). As shown in the detailed calculations in Appendix B of the permit application, emissions from the process vents were estimated as 14.7 tons per year. VOC emissions not lost through vents were assumed to be lost via fugitives as calculated from a material balance. Based on the material balance, approximately 93% of the VOC are assumed to be lost via fugitive emission sources and 7% are lost via process vents. The table below provides a summary of the VOC emissions.

Emissions Source	Amount	Basis for emissions
Total VOC emissions from expanded SFG Operations	217.4 tons per year	Based on maximum monthly VOC usage rate and scaled up to account for expansion
VOC Emissions from Process Vents	14.7 tons per year	Equations / methodology in 40 CFR 63.1257 and shown in Appendix B of the permit application.  Emissions were estimated assuming no control of the VOC.
VOC emissions from fugitives	202.7 tons per year	Total VOC emissions – VOC emissions from process vents

### 3.0 Project Regulatory Review

The modified SFG operations will be subject to the following regulations.

- 15A NCAC 2D .0530, Prevention of Significant Deterioration – Because the plant is located in Bertie County, an attainment area for all NAAQS, the planned modification and its emissions are required to be assessed in light of PSD requirements. Avoca is a major stationary source for PSD purposes, and the emission increases as a result of this modification exceed the significance levels as listed in 40 CFR 51.166 (23)(i). As discussed in greater detail in Section 4, the BACT limit for the SFG operation is 217.4 tons per year (tpy) of VOC (12-month running total).

- 15A NCAC 2D .0535, Excess Emissions Reporting and Malfunctions – This regulation applies to all permitted facilities and outlines the procedures of reporting excess emissions as a result of malfunctions or operational upsets. The facility owner/operator must notify the appropriate regional office of any excess emissions that are the result of a malfunction or upset condition and that last for greater than four hours. This report must be made within 24 hours of becoming aware of the occurrence.
- 15A NCAC 2D .0958, Work Practices for Sources of Volatile Organic Compounds – This regulation establishes work practice standards for sources that emit VOC. Because VOC are being used as a material processing media, the regulation is applicable to this facility.
- 15A NCAC 2D .1806, Control and Prohibition of Odorous Emissions – This rule is state enforceable only and is applicable facility-wide. Under this regulation, no facility shall operate without employing suitable measures for the control of odorous emissions. There is no history of odor complaints from the existing operations.

Based on the potential emissions from this project, the additional equipment added for the expansion of the SFG operations will be subject to Title V permitting. Avoca has requested that this application be processed pursuant to 15A NCAC 2Q .0501(d)(1) and the PSD rules (15A NCAC 2D .0530).

As noted above, Avoca used a blend of n-hexane (95%) and hexane isomers (5%) in the SFG operations until November 2014. The compound n-hexane is a hazardous air pollutant (HAP), which made the SFG operations subject to as the “NESHAP for Miscellaneous Organic Chemical Manufacturing,” 40 CFR 63 Subpart FFFF, also referred to the “Miscellaneous Organic NESHAP” or MON.

Per 40 CFR 63.2435(a), a facility is subject to the MON if it owns or operates miscellaneous organic chemical manufacturing process units (MCPU) that are located at a major source of HAPs. Further, a MCPU includes all equipment necessary to operate a miscellaneous organic chemical manufacturing process that satisfies all of the conditions specified in 40 CFR 63.2435(b)(1) through (3). Avoca will only use heptane and ethyl acetate, neither of which are HAPs, in the SFG operations after modification. With this change, the SFG operations no longer meet condition 40 CFR 63.2435(b)(2), which requires that a MCPU processes, uses, or generates an organic HAP. Thus, the SFG operations will not be subject to the MON after this modification, because it no longer processes, uses, or generates an organic HAP.

#### **4.0 Prevention of Significant Deterioration**

The basic goal of the PSD regulations is to ensure that the air quality in clean (i.e. attainment) areas does not significantly deteriorate while maintaining a margin for future industrial growth. The PSD regulations focus on industrial facilities, both new and modified, that create large increases in the emission of certain pollutants. The EPA promulgated final regulations governing the PSD in the Federal Register published August 7, 1980. Effective March 25, 1982, the NCDAQ received full authority from the EPA to implement PSD regulations in the state.

## 4.1 PSD Applicability

Under PSD requirements all major new or modified stationary sources of air pollutants regulated and listed in this section of the Clean Air Act must be reviewed and approved prior to construction by the permitting authority. A major stationary source is defined as any one of 28 named source categories that has the potential to emit 100 tons per year of any regulated pollutant or any other stationary source that has the potential to emit 250 tons per year of any PSD regulated pollutant. Avoca is a chemical processing plant, which is one of the 28 listed source categories with major source thresholds of 100 tons per consecutive 12-month period, under 40 CFR 51.166 (b)(1)(i)(a). It is a major stationary source for PSD purposes, therefore the emission increases as a result of this modification must be compared to the significance levels as listed in 40 CFR 51.166 (23)(i) to determine which pollutants must undergo a PSD review.

For this proposed modification, emissions of VOC exceed the significance level of 40 tons per year. Other PSD regulated pollutants are not emitted as part of this modification. Thus, Avoca performed the following reviews and analysis related to PSD for VOC for this modification:

- A BACT determination, and
- An additional impacts analysis including effects on soils, vegetation, and visibility.

## 4.2 BACT Analysis

Under PSD regulations, the determination of the necessary emission control equipment is developed through a BACT review. BACT is defined, in pertinent part, by the Federal Register [40 CFR 51.166 (b)(12)] as:

*An emissions limitation... based on the maximum degree of reduction for each pollutant... which would be emitted from any proposed major stationary source or major modification which the reviewing authority, on a case-by-case basis, taking into account energy, environment, and economic impacts and other costs, determines is achievable... for control of such a pollutant.*

The BACT requirements are intended to ensure that the control systems incorporated in the design of the proposed facility reflect the latest control technologies used in a particular industry and take into consideration existing and future air quality in the vicinity of the facility. Additionally, the BACT analysis may consider the impacts of non-criteria pollutants and unregulated toxic air pollutants, if any are emitted, when making the BACT decision for regulated pollutants. The pollutant subject to PSD review for the expanded SFG operations at Avoca is VOC.

Each pollutant subject to a PSD review must meet the criteria of BACT, which refers to the maximum amount of emission reduction currently possible with respect to technical application and economic, energy, and environmental considerations. Because equipment within categories of sources vary widely, it is difficult to establish a uniform BACT determination for a particular pollutant or source. Economics, energy, and environment in combination with the unique functions of the source and engineering design, require BACT to be determined on a case-by-case basis. In most instances BACT may be defined through an emission limitation. In cases where this is impossible, BACT can be defined by the use of a particular type of control device and its achievable emission reduction efficiency. In no event can a technology be recommended that would not comply with any applicable standard of performance under 40 CFR Part 60 and 61.

The BACT analysis performed for Avoca included five basic steps listed below:

- 1) Identify all control technologies,
- 2) Eliminate technically infeasible options,
- 3) Rank remaining control technologies by control efficiencies,
- 4) Evaluate the most effective controls and document results, and
- 5) Select BACT.

The first step in this approach is a comprehensive listing of control technologies for each applicable pollutant. Step two is a demonstration of technical feasibility to ensure the technology evaluated was appropriate for the characteristic gas stream to be treated. Step three ranks the remaining control technologies by control effectiveness, including the control efficiencies (percent of pollutant removed), expected emission rate (tons per year and pounds per hour), expected emission reduction (tons per year), economic impacts (cost effectiveness), environmental impacts (including emission of toxic or hazardous air contaminants), and energy impacts (benefits or disadvantages). Step four is a case-by-case evaluation of energy, environmental, and economic impacts. Step five requires the selection of BACT for the emission source. While the steps are similar to EPA's top-down process, unlike the EPA decision process, NCDAQ follows statutory mandate that economics, energy, and environmental impacts of candidate technologies be evaluated.

### **4.3.BACT Analysis for SFG Process Vents**

#### **4.3.1 Identify Control Technologies**

An investigation was performed to identify current regulatory BACT/LAER determinations for extraction operations. Because SFG operations are unique, the search focused on proven control technologies for other extraction operations, which are mostly associated with vegetable oil extraction, such as soybeans. The search involved a review of EPA's RACT/BACT/LAER clearinghouse (RBLC), which included information on BACT and LAER decisions throughout the country.

The review of NSR permit data in the RBLC identified 59 decisions involving facilities with emission sources comparable to the proposed sources. The primary types of controls identified as BACT in the RBLC search were mineral oil scrubbers, alone or with condensers (13); scrubbers or absorption, but not specifically mineral oil scrubbers, alone or with condensers (14); and emission limits (9). A carbon adsorption was identified as control in one draft decision in the RBLC results. Five decisions cited leak detection and repair (LDAR) as BACT for process leaks. Also, note that not all these controls were installed as a result of BACT or LAER requirements. The results of the RBLC search were provided in an e-mail dated September 16, 2015 to Betty Gatano of the NCDAQ.

Based on an extensive search of RBLC results, as well as a review of relevant literature and knowledge of controls for similar industries, the following control technologies were considered in this BACT analysis:

- Thermal Oxidation Systems
- Catalytic Oxidation Systems
- Adsorption Systems
- Absorption Systems
- Biofiltration Systems
- Condensation Systems.

### 4.3.2 Eliminate Technically Infeasible Options

#### Catalytic Oxidation/Thermal Catalytic Oxidation

In a catalytic oxidizer, a catalyst is used to lower the activation energy needed for oxidation. When a preheated gas stream is passed through a catalytic oxidizer, the catalyst bed initiates and promotes the oxidation of VOC without being permanently altered. In catalytic oxidation, combustion occurs at significantly lower temperatures than with thermal oxidization. However, care must be taken to ensure complete combustion.

A major disadvantage of catalytic oxidization is the high cost of fuel and catalyst replacement. Although catalytic oxidization requires less fuel than thermal oxidization at the same heat recovery rate, the catalyst replacement costs can be significant. In some cases, disposal of spent catalyst can also prove a difficult hurdle because of deposits of potentially hazardous substances.

Catalytic oxidation is not considered to be technically feasible in this situation. Oxidation is a potential source of ignition and explosion hazard, which is not appropriate when a facility uses a high quantity of explosive material, such as heptane. In addition, the SFG operations may contain chemical compounds that could poison the catalyst. A review of the RBLC search confirmed no extraction processes with this control technology.

#### Carbon Adsorption

Adsorption is a process where VOCs are removed from low to medium concentration gas streams. The gas molecules pass through a bed of solid particles such as activated carbon, which is the most widely used adsorbent. The molecules are held to the adsorbent by attractive forces that are weaker than chemical bonds.

One draft decision in the RBLC identified carbon adsorption as control on an extraction process. As shown in the results of the RBLC search, the extraction industry primarily uses condensers and mineral oil scrubbers as BACT. Carbon adsorption has been eliminated as a technology has not been demonstrated in practice in the biological extraction industry.

#### Bio-oxidation / Biofiltration

Bio-filtration is an air pollution control technology in which VOCs are oxidized using living micro-organisms on a media bed (sometimes referred to as a bioreactor). As emissions flow through the bed media, pollutants are absorbed by moisture on the media and come into contact with the microbes. The microbes consume and metabolize the excess organic pollutants, converting them to carbon dioxide and water, much like a traditional oxidation process.

The efficacy of bio-oxidation and biofiltration to remove VOC and HAP emissions from the Avoca plant is unknown. A review of the RBLC search confirms no extraction processes using this control technology as BACT. Due to the undemonstrated nature of bio-oxidation/biofiltration in the biologic extraction industry, this technology has been eliminated from further consideration.

### 4.3.3 Rank Remaining Control Technologies by Effectiveness

The remaining control technologies were ranked from the most stringent to the least stringent, as shown in the table below.

<b>Control Technology</b>	<b>Approximate Control Efficiency (%)</b>
Regenerative Thermal Oxidation (RTO) + Condenser	98%
Mineral Oil Scrubber (Packed bed absorption) + condenser	98%
Condenser	65%

#### Thermal Oxidation (Regenerative)

In regenerative oxidation, the inlet gas stream is drawn through a hot ceramic or stoneware bed that preheats the gas stream prior to its entering the combustion chamber. The hot flue gas exits the oxidizer and passes into a second ceramic bed, which captures and stores thermal energy. When this bed has been heated sufficiently, the flow is switched so that the inlet gas is now redirected through the hot bed and the exhaust gas is passed through the now cool primary bed. By switching flows in this manner, high heat exchanger temperatures are maintained. Aside from the ceramic media heat exchanger, regenerative systems operate in the same manner as conventional thermal oxidization.

Regenerative oxidizers provide a high degree of thermal heat recovery and are useful for situations where the air flowrate is high and VOC concentration is low. In these cases, a significant amount of heat recovery is required to minimize overall system operating costs. Costs can be high because of the capital investments, and supplemental fuel along with other operating costs.

#### Mineral Oil Scrubber (Absorption)

Absorption systems, like the mineral oil scrubber, are used to control gas-phase VOC. The effectiveness of the absorption system will depend on the solubility of the pollutant in the liquid stream, the gas and liquid throughput rates, and the type of scrubber that is selected. The typical scrubber used of this type of operation is a mineral oil scrubber as was confirmed by the search of the RBLC for extraction processes.

#### Condensers

Condensers operate by separating volatile compounds in a vapor mixture from the remaining vapors by means of saturation followed by a phase change. Condensers are typically refrigerated to decrease the temperature to aid in saturation and therefore increase the removal efficiencies of the units. There are two common types of condensers used for VOC removal – surface and contact condensers. The coolant does not contact the gas stream in surface condensation; the vapor condenses as a film on the cooled surface and then discharges to a collection tank. Conversely, the vapor stream is sprayed with a liquid coolant in a contact condenser. The VOCs contained within the waste coolant often create a disposal problem because they cannot be recycled or separated from the stream without additional processing.

Because the condenser's removal efficiency is highly dependent on the characteristics of the waste gas stream, they are only feasible for removing certain compounds. Compounds with high boiling points and low volatility are more easily condensable than compounds with low boiling points and high volatility. EPA recommends, as a conservative starting point for considering condensers as a control, that the VOCs have boiling points above 100° F. Heptane has a boiling point of approximately 209°F, and condensers are technically feasible as a control option for the SFG operations.

#### 4.3.4 Evaluate Technically Feasible Control Options

A BACT analysis, consistent with the Clean Air Act, was performed on the add-on control technologies that were shown to be technically feasible.

##### Assumptions Used in the BACT analysis

To perform the BACT analysis, it was necessary to make engineering judgments concerning the control efficiency of various add-on controls. The destruction efficiency of the RTO and condenser was estimated as 98%. The removal efficiency of the mineral oil scrubber and condenser and the condenser alone was estimated as 98% and 65%, respectively.

Other assumptions used in performing this analysis are included in the detailed cost calculations presented in Appendix C of the permit application. All cost estimates were prepared using potential VOC emission rates for the expanded SFG operations. Annual operational hours were assumed to be 8,760 per year.

##### Cost Effectiveness

The cost impacts of controlling equipment emissions with add-on controls are presented in the table below. The estimated cost impacts were estimated using the Office of Air Quality Planning and Standards Control Cost Manual (CCM)<sup>5</sup>, past permitting experience, EPA Technology Fact Sheet for packed bed scrubbers, and vendor quotes for the condenser. All costs provided in the CCM were updated to 2014 dollars using Consumer Price Index Price Inflation calculator<sup>6</sup>.

<b>Add-On Control Technology</b>	<b>Baseline Emissions (tons/yr)</b>	<b>VOC Emissions Reduction (%)</b>	<b>VOC Emissions Reduction (tpy)</b>	<b>Total Capital Cost (2014 \$)</b>	<b>Total Annual Cost (\$/yr)</b>	<b>Cost - Effectiveness (\$/Ton)</b>
RTO and condenser	14.73	98%	14.4	\$621,848	\$286,134	\$19,822
Mineral Oil Scrubber and condenser	14.73	98%	14.4	\$4,785	\$142,243	\$9,854
Condenser only	14.73	65%	9.6	\$28,560	\$150,631	\$15,733
<b>Notes:</b> Avoca would not install a mineral oil scrubber or RTO alone but would install a combination of condenser and mineral oil scrubber or RTO. The cost for the RTO and the mineral oil scrubber do not include the cost of the condenser. Even excluding the condenser, these control devices are not cost effective.						

##### Energy and Environmental Impacts

Although each of the potentially feasible add-on control devices evaluated would provide reductions in VOC emissions, each device would also have associated negative energy and environmental impacts. The energy and secondary environmental impacts are presented in the table below for each add-on control alternative. In the case of thermal oxidization, the combustion of natural gas would result in small quantities of combustion pollutants: nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>2</sub>),

<sup>5</sup> Office of Air Quality Planning and Standards Cost Control Manual. Fourth Edition. EPA-450/3-90-006. Office of Air Quality Planning and Standards, Environmental Protection Agency, Research Triangle Park, North Carolina. January 1990.

<sup>6</sup> Consumer Price Index Calculator developed by the US Department of Labor Bureau of Labor Statistics.

particulate matter (PM), carbon monoxide (CO), and VOCs. Emission factors from EPA's AP-42 document are used to calculate these emissions.

Control Technology	Emissions (tpy)					Energy Impacts
	NO <sub>x</sub>	SO <sub>2</sub>	PM	CO	VOC	Electricity Increase over Baseline (MW-hr/yr)
RTO and condenser	0.09	--	0.01	0.07	--	1.13
Mineral Oil Scrubber and condenser	--	--	--	--	--	1.13
Condenser only	--	--	--	--	--	70.1
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Natural gas emission factors from EPA's AP-42, Section 1.4 (7/98).</li> <li>• Natural gas requirements based on vendor specifications.</li> <li>• Natural gas fuel content assumed to be 1,020 Btu/scfm.</li> </ul>						

#### 4.3.5 Select BACT for Process Vents

Although add-on controls appear to be technically feasible, after consideration of the environmental, energy, and economic impacts, it was determined that BACT for the process vents do not include these controls.

#### 4.4 VOC BACT Analysis for Process Fugitives

Equipment leaks and other fugitive emissions from the SFG operations are quantifiable based on a material balance of the solvents (heptane and ethyl acetate) used in the process. The emissions occur at various locations or points throughout the SFG operations and the facility indicates that these emissions cannot be easily controlled. The SFG operations are not subject to any Maximum Achievable Control Technology (MACT) standards or New Source Performance Standards (NSPS), and as such, there are no rules applicable to the SFG operations that would require Leak Detection and Repair (LDAR). Thus, Avoca is proposing no work practice standards for this process. Emissions will continued to be calculated via material balance.

#### 4.5 Wastewater

In a 2004 PSD permit application, Avoca proposed BACT to be fixed roof tanks for the process wastewater tanks associated with the Rotocel, Recovery, Biomass Extraction, and Botanical Extraction operations. These same tanks will be used for SFG wastewater. Avoca will continue to comply with the 2004 BACT for wastewater tanks by using fixed roof tanks for all its wastewater operations.

#### 4.6 Overall BACT Limit

Avoca is requesting a BACT limit for the SFG operations of 217.4 tons per 12-month period. The most practical approach for assessing compliance is to continue to conduct a monthly solvent material balance to assess compliance with the BACT limit.



#### 4.7.PSD Air Quality Impact Analysis

PSD regulations [40 CFR 51.166(k)] require an applicant to perform an ambient impact analysis to demonstrate, 1) that no NAAQS will be exceeded at any location and during any time period where the proposed new source or modification will have significant impact; and 2) that the proposed new source or modification, in combination with other increment-affecting sources, will not cause any allowable PSD increment to be exceeded. PSD regulation 40 CFR 51.166(m) requires analysis of ambient air quality in the impact area of the proposed source or modification for all pollutants (including those for which no NAAQS exist) with emissions increases in significant [40 CFR 51.166(b)] quantities.

##### Potential Emissions

VOC emissions are considered precursors to ozone formation. PSD regulations [40 CFR 51.166(i)] state that an ambient impact analysis of ozone, including the gathering of ambient air quality data, could be required if the net VOC emission increase is greater than 100 tpy. Previous and ongoing regional air dispersion modeling efforts to determine ozone attainment within the North Carolina air shed have shown that VOC emissions at the level stated above will not contribute, by itself, to significant ozone formation. No additional monitoring or modeling is required for this pollutant.

##### Non-Regulated Pollutant Impact Analysis

Ethyl acetate is a Toxic Air Pollutant (TAP) and the emissions of this TAP will increase after this permit modification. Further, the SFG operations are not subject to a MACT and are not exempt from NC Air Toxics. As required per 15A NCAC 2Q .0706(c), the permit application included an evaluation for ethyl acetate for compliance with NC Air Toxics.

The maximum monthly emissions for ethyl acetate in calendar year in 2014 as reported in the permit application are provided in the following table. As shown below, the facility-wide emissions after modification are less than the toxic permitting emission rate for ethyl acetate. Thus, the modification of the SFG operations poses no unacceptable risk to human health, and no further analysis is needed.

<b>Operations</b>	<b>Ethyl Acetate Emissions 2014 (lb/month)</b>	<b>Ethyl Acetate Emissions after Expansion (lb/month)</b>	<b>Total Emissions of Ethyl Acetate after Expansion (lb/hr)</b>	<b>Ethyl Acetate TPER (lb/hr)</b>
Botanical SDA	48.86	48.86	10.4	36
Botanical	130.72	130.72		
Biomass	103.27	103.27		
PNE	63.73	63.73		
SFG	2086	7113.3		
Total	2432.6	7459.9		
<u>Notes:</u> The hourly emissions were calculated assuming 30 days per month and 24 hours per day operation.				

##### SER Analysis

As noted previously, VOC emissions from this project are above the SER for PSD. Potential emissions for all other PSD pollutants remain unchanged after expansion of the SFG operations and are therefore not subject to PSD review.

## **4.8.Additional Impact Analysis**

PSD regulations [40 CFR 51.166(k)] also require a discussion of additional impacts and evaluation of potential impacts at Class I areas. The additional impact analysis generally has four parts as follows:

- Visibility impairment
- Growth
- Soils impacts, and
- Vegetation impacts.

Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. The nearest Class I area is Swanquarter National Wilderness Area, which is located approximately 68 km southeast of the facility.

### **4.8.1 Visibility Impairment**

Visibility impairment is primarily a function of PM and NO<sub>x</sub> emissions. Avoca is not subject to PSD review for any pollutants other than VOC, and emissions of PM and NO<sub>x</sub> are not changing as a result of the proposed modification. Because there are no significant increases of visibility-affecting pollutants, no analysis of visibility impairment is required for this project.

### **4.8.2 Growth Analysis**

The growth analysis includes the projection of the associated industrial, commercial and residential source emissions that will occur in the area due to modification of the source. The evaluation looked at the local work force increase and assessed secondary emission sources that potentially will build in the area to support the Avoca facility.

Approximately 100 people are currently employed by the Avoca facility. Avoca does not anticipate that the number of employees will increase due to the proposed modification.

Employment for Bertie County was obtained from the NC Department of Commerce. The data indicates an average unemployment rate of 10.5% (1,008 people). If Avoca needs to increase employment due to this modification, workers are expected to come from the existing labor pool. No new support services or suppliers are expected to locate in the area as a result of this project. Thus, the impact of economic growth associated with the proposed project will be negligible.

### **4.8.3 Soils and Vegetation**

The only potential impact on soils and vegetation resulting from the proposed project would be on long term damage associated with the elevated ozone levels. The effects of ozone on vegetation are well documented. Symptoms of ozone damage include reduction in growth rates, reduction in reproductive rates, direct foliar damage, and mortality.

VOCs are regulated because they can be a precursor to ozone formation. In addition to VOCs, an important component of ozone formation is the ambient concentration of NO<sub>x</sub>. Studies have shown that ozone formation in the southeast is NO<sub>x</sub> limited, meaning that ozone formation is limited by the amount of NO<sub>x</sub> in the atmosphere rather than the amount of VOCs. Because this project will

increase the amount of VOCs emitted rather than NO<sub>x</sub>, it is unlikely to significantly impact the amount ozone formed and, consequently, it will not adversely affect vegetation in the surrounding area.

#### **4.8.4 Class I Impact Analysis**

PSD Class I impact analyses contain evaluations of Air Quality Related Values (AQRV) and PSD increment were applicable. AQRV are typically defined as visibility (both near-field plume impairment and/or regional haze) and acidic deposition. As previously discussed, there will be no significant increases of any visibility-affecting pollutants as a result of this modification. Thus, no visibility analysis is warranted. There are also no significant increases of any deposition-related pollutants (SO<sub>2</sub> or NO<sub>x</sub>) expected as result of this modification. Therefore, no deposition analysis is required. Finally, there are no modeling related standards for VOCs (e.g. NAAQS or PSD increments). Therefore, no Class I or Class II area dispersion modeling analyses are required for this permit modification.

#### **4.9 Public Participation Requirements**

In accordance with 40 CFR 51.166(q), Public participation, the reviewing authority (NCDAQ) shall meet the following:

- 6) Make a preliminary determination whether construction should be approved, approved with conditions, or disapproved.

This document satisfies this requirement providing a preliminary determination that construction should be approved consistent with the permit conditions described herein.

- 7) Make available in at least one location in each region in which the proposed source would be constructed a copy of all materials the applicant submitted, a copy of the preliminary determination, and a copy or summary of other materials, if any, considered in making the preliminary determination.

This preliminary determination, application, and draft permit will be made available in the Washington Regional Office and in the Raleigh Central Office, with the addresses provided below.

Washington Regional Office  
943 Washington Square Mall  
Washington, NC 27889

Raleigh Central Office  
217 West Jones Street  
Raleigh, NC 27603

In addition, the preliminary determination and draft permit will be made available on the NCDAQ public notice webpage.

- 8) Notify the public, by advertisement in a newspaper of general circulation in each region in which the proposed source would be constructed, of the application, the preliminary determination, the degree of increment consumption that is expected from the source or modification, and of the opportunity for comment at a public hearing as well as written public comment.

The NCDAQ prepared a public notice (See Appendix A) that will be published in a newspaper of general circulation in the region.

- 9) Send a copy of the notice of public comment to the applicant, the Administrator and to officials and agencies having cognizance over the location where the proposed construction would occur as follows: Any other State or local air pollution control agencies, the chief executives of the city and county where the source would be located; any comprehensive regional land use planning agency, and any State, Federal Land Manager, or Indian Governing body whose lands may be affected by emissions from the source or modification.

The NCDAQ will send the public notice (see Appendix A) to the Town Administrator of Windsor at PO Box 508, 106 Dundee Street Windsor, NC 27983 and the Bertie County Manager at PO Box 530, 106 Dundee Street, Windsor, NC 27983.

- 10) Provide opportunity for a public hearing for interested persons to appear and submit written or oral comments on the air quality impact of the source, alternatives to it, the control technology required, and other appropriate considerations.

The NCDAQ public notice (See Appendix A) provides contact information to allow interested persons to submit comments and/or request a public hearing.

## **5.0 Other Issues**

### **5.1 Compliance**

NCDAQ has reviewed the compliance status of this facility. During the most recent inspection completed during three site visits on December 16, 2014, January 12, 2015, and January 15, 2015, Betsy Huddleston of the Washington Regional Office indicated that the facility appeared to be in compliance with all applicable requirements. Additionally, a signed Title V Compliance Certification (Form E5) indicating that the facility was in compliance with all applicable requirements was included with the permit application, received on September 4, 2015.

The following is the five-year compliance history for the facility.

- A Notice of Violation/Notice of Recommendation for Enforcement (NOV/NRE) was issued on October 31, 2012 for a failed particulate stack test. The biomass boilers had exceeded the particulate matter standard under 40 CFR Part 63, Subpart DDDDD. A civil penalty in the amount of \$4,549, including costs, was issued on February 14, 2013. The civil penalty was paid in full on March 22, 2013.
- A Notice of Deficiency (NOD) was issued on March 5, 2014 because the downtime of the oxygen analyzer and steam meter on boilers (ID Nos. ES-BB1 and ES-BB2) exceeded the allowable thresholds.

All NOV's, NOV/NREs, and NODs have been resolved.

### **5.2 Zoning Requirements**

The area in which Avoca is located does not have zoning. As such, a notice was placed in the local paper and a sign has been placed in front of the plant as required pursuant to 15A NCAC 2Q .0113.

The facility provided an affidavit and proof of publication of the legal notice as part of the permit application.

### **5.3 Professional Engineer's Seal**

A Professional Engineer's seal was included with the application. Mr. M. Dale Overcash, a Professional Engineer, who is currently registered in the State of North Carolina, sealed the application for the portions containing the engineering plans, calculations, and all supporting documentation.

### **5.4 Application Fee**

An application fee in the amount of \$14,294.00 was received.

### **5.5 CAA Section 112(r)**

The facility is not subject to Section 112(r) of the Clean Air Act requirements because it does not store any of the regulated substances in quantities above the thresholds in 112(r). This permit modification does not affect the 112(r) status of the facility.

### **6.0 Conclusion**

Based on the application submitted and the review of this proposal by the NCDAQ, the NCDAQ is making a preliminary determination that the project can be approved and a revised permit issued. After consideration of all comments a final determination will be made.

**ATTACHMENT C**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Permit Issue Date: March 10, 2015**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Betsy Huddleston  
**Date of Last Inspection:** 01/15/2015  
**Compliance Code:** 3 / Compliance - inspection

<b>Facility Data</b>  <b>Applicant (Facility's Name):</b> Avoca Incorporated  <b>Facility Address:</b> Avoca Incorporated 841 Avoca Farm Road Merry Hill, NC 27957  <b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing  <b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V				<b>Permit Applicability (this application only)</b>  <b>SIP:</b> 15A NCAC 02Q .0515, .0516, 02D .0958 <b>NSPS:</b> N/A <b>NESHAP:</b> 15A NCAC 02D .1111 <b>PSD:</b> N/A <b>PSD Avoidance:</b> N/A <b>NC Toxics:</b> N/A <b>112(r):</b> N/A <b>Other:</b> N/A			
<b>Contact Data</b>				<b>Application Data</b>			
<b>Facility Contact</b>  Brian Conner Environmental Health & Safety Manager (252) 482-2133 PO Box 129 Merry Hill, NC 27957	<b>Authorized Contact</b>  David Peele Owner / President (252) 482-2133 PO Box 129 Merry Hill, NC 27957	<b>Technical Contact</b>  Samuel Tynch Director of Operations/Engineering (252) 482-2133 PO Box 129 Merry Hill, NC 27957	<b>Application Number:</b> 0800044.14D and .14E <b>Date Received:</b> 12/11/2014 <b>Application Type:</b> Modification <b>Application Schedule:</b> TV-Sign-501(c)(2) <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 01819/T43 <b>Existing Permit Issue Date:</b> 12/19/2014 <b>Existing Permit Expiration Date:</b> 07/31/2015				
<b>Total Actual emissions in TONS/YEAR:</b>							
CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2013	11.85	27.84	1055.94	18.70	0.4600	250.74	155.43 [Methanol (methyl alcohol)]
2012	13.64	24.08	931.29	43.64	0.4430	214.72	145.25 [Methanol (methyl alcohol)]
2011	17.06	13.79	491.30	2.79	0.6600	123.95	68.53 [Methanol (methyl alcohol)]
2010	13.60	9.07	231.31	1.90	0.4200	67.49	52.54 [Hexane, n-]
2009	16.94	11.33	309.15	2.37	0.5200	49.16	26.74 [Hexane, n-]

<b>Review Engineer:</b> Kevin Godwin  <b>Review Engineer's Signature:</b> <b>Date:</b>	<b>Comments / Recommendations:</b> <b>Issue</b> 01819/T44 <b>Permit Issue Date:</b> 03/10/2015 <b>Permit Expiration Date:</b> 07/31/2015
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## I. Introduction and Purpose of Application

- A. According to the application, the facility extracts oils, nutrients from plant materials for use in flavorants, fragrances, food additives and dietary supplements.
- B. This permit action addresses two applications (.14D and .14E) received on December 11, 2014.
  1. .14D minor modification under 15A NCAC 02Q .0515 requesting the following changes:
    - a. add a new dryer equipped with chilled water condenser and distillate tank (ID No. D-1002) after the centrifuge (ID No. C-1203) in the PNE operations,
    - b. remove a underground ethanol storage process tank from the PNE operations (ID No. TK-9214),
    - c. modify conditions to indicate the scrubbers are not required to operate during PNE and EVG operations.
  2. .14E significant modification under 15A NCAC 02Q .0516 requesting a re-evaluation of the operating temperature limit for the cryogenic condensers in the Botanical/Biomass Extraction Operations.

## II. Changes to Existing Air Permit

The following table provides a summary of the changes in Permit No. 01819T44.

Page No.	Condition No.	Description of Change(s)
N/A	Cover letter	Included language pertaining to significant modification under 15A NCAC 02Q .0516 and minor modification under 02Q .0515
Global	Global	Updated permit number, permit format, and dates.
3	Table of Emission Sources	Included new dryer (ID No. D-1002) and footnote pertaining to minor modification under 02Q .0515.
19	2.1 D.3.b.	Updated CAM condition for water-soluble solvents.
31	2.2 B.1.h.	Included 17 °F outlet temperature requirement for cryogenic condensers when using water-soluble solvents.
44	2.2 C.	Included dryer equipped with process condenser (ID No. D-1002) in equipment list under PNE Operations.

## III. Statement of Compliance

The facility was most recently inspected on 12/16/2014, 1/12, and 1/15/2015 by Ms. Betsy Huddleston, Washington Regional Office (WaRO). The inspection report is still in draft and does not yet appear in IBEAM. According to Ms Huddleston's memo dated December 18, 2014, much of the facility was not in operation. The facility appeared to be in compliance at the time of inspection.

According to Ms. Huddleston's memo dated September 20, 2014, the facility appeared to be in compliance with the permit conditions and applicable regulations at the time of the 12/04, 12/05, and 12/19/2013 inspection with the exception of failing to monitor steam flow and oxygen on the wood-fired boilers. A Notice of Deficiency (NOD) was issued on March 6, 2014.

Permit issues noted in the inspection report will be addressed with the upcoming permit renewal.

#### IV. Process Emissions

- A. According to the application, the PNE operation is a non-dedicated batch process for the extraction of various products from powdered plant material. PNE operations utilize a series of process tanks, a centrifuge, and a waste solids separator.

Avoca has estimated emissions using the heating calculations provided in 40 CFR Part 63, Subpart FFFF – Miscellaneous Organic Chemical Production and Processes (MON)[§63.2440]. Controlled VOC emissions from the process while operating with heptanes are projected to be 1.83 tpy.

The new dryer (ID No. ES-D1002) is a batch operation. VOC emissions are calculated to be 0.82 lb/batch. Potential batches are reported as 3 batches/day and 1,080 batches/year. Total controlled emissions are 0.44 tpy

Even though tank (TK-9214) is being removed, seven (7) process tanks will remain due the addition of the new distillate tank.

- B. According to the application, the Botanical (Crown I) and Biomass (Crown II) Extraction Operations utilize chemical solvents to extract products from plant material. Avoca uses a calculation methodology submitted in the March 2004 PSD application to calculate the cryogenic condenser operating temperature for various VOC solvents and needed to meet the required 14.1 lb/hr VOC BACT limit.

The 2004 PSD application was based on the worst-case solvent, hexane. Since installing the cryogenic condenser there have been unforeseen operational disadvantages associated with freezing when water-soluble solvents and an operating temperature of -40°F is set for the condenser. Avoca has re-evaluated the operating temperature required for water-soluble solvents. Methanol is the worst case water-soluble solvent. The proposed operating temperature required to meet the 14.1 lb/hr VOC limit is 17°F for current and future water-soluble solvents.

#### V. Regulatory Review

- A. 15A NCAC 02D .1111 – According to the application, the submitted Notice of Compliance Status (NOCS) for MON indicates that the PNE operations are currently not using hazardous air pollutants (HAP). The current permit indicates that the PNE operations are subject to MON and Avoca will submit NOCS prior to utilizing HAP. Avoca does not propose any updates to this scenario.

The Botanical/Biomass Extraction Operations are permitted as being subject to MON, however to date these operations have not operated processes that are subject to MON. The process has used HAP in the form of hexane, but the operations produce product for the food industry and not the chemical industry and were not categorized in the subject NAICS codes.

- B. 15A NCAC 02D .0614 “Compliance Assurance Monitoring (CAM)” – The PNE operations will be controlled sources, but pre-controlled VOC are less than 100 tpy. Thus, the control devices are not subject to CAM requirements.
- C. 15A NCAC 02D .0958 “Work Practices for Sources of Volatile Organic Compounds” – This regulation establishes work practices for sources of VOC. Avoca will continue to comply with work practices for applicable sources.
- D. State-only 15A NCAC 02D .1100 “Control of Toxic Air Pollutant Emissions” and 15A NCAC 02Q .0700 “Toxic Air Pollutant Procedures” – Toxic Air Pollutant (TAP) limits were previously removed as allowed under HB 952. All emission sources at the facility are covered under Part 63. The operations listed in the application are covered under a Part 63 standard.



The proposed new process will utilize heptanes with approximately 4% ethyl acetate (EA). EA is a listed NC TAP. EA emissions are calculated to be 0.033 lb/batch. Based on a potential of 3 batches per day, the resulting increase in EA emissions is 0.10 lb/day. The toxic permit emission rate (TPER) for EA is 36 lb/hour. The increase does not pose an unacceptable health risk.

## **VI. Other Regulatory Considerations**

- An application fee of \$904.00 for each application was received by DAQ.
- The appropriate number of application copies was received by DAQ.
- A Professional Engineer's Seal is required for the applications and was provided (ref. Dana Norvell, P.E. Seal # 02884, 12-10-14).
- Avoca is located in an area without local zoning. A sign was placed on the property and public notice was advertised in the local newspaper on November 19, 2014. This serves as the zoning consistency determination.
- Public notice is not required for this 1<sup>st</sup> Step of a significant modification under 15A NCAC 02Q .0516 and minor modification under 15A NCAC 02Q .0515.
- IBEAM TVEE update was verified on March 2, 2015.
- According to the application, the facility does not store any materials in excess of the 112r applicability threshold.
- The applications were signed by Dr. David Peele, President, on December 5, 2014.

## **VII. Recommendations**

These applications have been reviewed by DAQ to determine compliance with all procedures and requirements. DAQ has determined that this facility appears to be or is expected to achieve compliance as specified in the permit with all applicable requirements. A draft permit was provided to the applicant and WaRO on March 2, 2015. All comments were addressed.

Issue P/N 01819T44.

**ATTACHMENT D**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Permit Issue Date: November 26, 2013**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Arni Hopkins  
**Date of Last Inspection:** 10/15/2012  
**Compliance Code:** 3 / Compliance - inspection

<b>Facility Data</b>  <b>Applicant (Facility's Name):</b> Avoca Incorporated  <b>Facility Address:</b> Avoca Incorporated 841 Avoca Farm Road Merry Hill, NC 27957  <b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing  <b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V			<b>Permit Applicability (this application only)</b>  <b>SIP:</b> <b>NSPS:</b> <b>NESHAP:</b> 112(g) avoidance less than 10 tpy n-hexane from sage dryer (ID No. ES-RD) <b>PSD:</b> <b>PSD Avoidance:</b> less than 40 tpy VOC from sage dryer (ID No. ES-RD) <b>NC Toxics:</b> <b>112(r):</b> <b>Other:</b>		
<b>Contact Data</b>			<b>Application Data</b>		
<b>Facility Contact</b>  Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	<b>Authorized Contact</b>  David Peele Owner / President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	<b>Technical Contact</b>  Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	<b>Application Number:</b> 0800044.12A <b>Date Received:</b> 04/03/2012 <b>Application Type:</b> Modification <b>Application Schedule:</b> TV-Sign-501(c)(2) <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 01819/T40 <b>Existing Permit Issue Date:</b> 06/06/2013 <b>Existing Permit Expiration Date:</b> 07/31/2015		
<b>Review Engineer:</b> Kevin Godwin  <b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____			<b>Comments / Recommendations:</b> <b>Issue</b> 01819/T41 <b>Permit Issue Date:</b> 11/26/2013 <b>Permit Expiration Date:</b> 07/31/2015		

**I. Introduction and Purpose of Application**

A. Avoca Inc. extracts oils and nutrients from plant materials for use in flavorants, food additives, and dietary supplements at this Bertie County plant.

B. This permit action is for the following changes:

1. Update CO and NOx emission factors for the biomass boilers (ID Nos. ES-BB1 and BB2). According to the application, stack testing performed on December 6, 2011 while firing wood has shown the measured emission factors are 0.068 lb/MMBtu for NOx and 0.0008 lb/MMBtu for CO. These factors were approved by Mr. James Hammond, Stationary Source Compliance Branch, on January 24, 2012.

As reported in the application, 0.085 lb/MMBtu for NOx and 0.27 lb/MMBtu for CO are used along with the updated heat input for the boilers.

2. Replace the existing 6 MMBtu/hr burner on the rotary dryer with a 30 MMBtu/hr burner and add propane as a fuel.

3. Update the maximum burner rating of the two (2) biomass boilers. According to the application, based on most recent source testing, the boilers have a maximum heat input rating greater than the permitted 18.6 MMBtu/hour each. The applicant is requesting to increase maximum heat input to 24 MMBtu/hour each.
  4. Request a limit of less than 40 tpy VOC from the rotary dryer to avoid triggering PSD requirements,
  5. Request a limit of less than 10 tpy n-hexane from the rotary dryer to avoid being subject to the 112(g) requirements listed in 2D .1112, and
  6. Clarification of the operating configuration of the sage drying system.
- C. Because this modification involves a significant change to existing monitoring, recordkeeping, and reporting requirements, it is considered a significant modification. The applicant has requested the modification be processed under 15A NCAC 02Q .0501(c)(2). Regulation 02Q .0501(c)(2) allows for construction with a requirement for the Permittee to submit an application with 12-months of commencing operation to comply with 02Q .0500.
- D. Also included in this application is a request for a 502(B)(10) change per 15A NCAC 02Q .0523. The change involves addition of a molecular sieve (ID No. ES-MSDU-1024) in the Botanical Extraction Operations. According to the request received on August 5, 2013, the addition will enhance on-site operations by allowing dewatering of ethanol to <1% water. The ethanol is currently sent away for dewatering. The change will not result in any increase in emissions. The source is included in the permit upon this significant modification.

## II. Changes to Existing Permit

The following table provides a summary of the changes in Permit No. 01819T41.

Page No.	Condition No.	Description of Change(s)
Global	Global	Updated permit number and dates.
8	Table of Emission Sources	<ul style="list-style-type: none"> <li>- Updated burner rating for biomass boilers (ID Nos. ES-BB1 and BB2) to 24 million Btu/hour each,</li> <li>- Included replacement burner for rotary sage dryer (30 million Btu/hour, ID No. ES-RD), and</li> <li>- Included propane as permitted dryer fuel</li> <li>- Included molecular sieve (ID No. ES-MSDU-1024) in the Biomass Extraction Operations as a 502(B)(10) change.</li> </ul>
8	N/A	<ul style="list-style-type: none"> <li>- Included footnote to table pertaining to a significant modification using the procedure under 15A NCAC 02Q .0501(c)(2) for sources (ID Nos. ES-BB1, BB2, and RD).</li> <li>- Included footnote to table pertaining to 502(B)(10) change per 15A NCAC 02Q .0523.</li> </ul>
16	2.1 D.	Included molecular sieve (ID No. ES-MSDU-1024) in Botanical Extraction Operations equipment listing.
50	2.2 D.	Included PSD avoidance condition of less than 40 tpy VOC from the biomass boilers and rotary sage dryer.
51	2.2 E.	Included 112(g) avoidance condition of less than 10 tpy n-hexane from the rotary sage dryer.

## III. Statement of Compliance

Avoca was last inspected by Mr. Arni Hopkins of the Washington Regional Office (WARO) on October 15, 2012. According to the inspection report, this facility appeared to be operating in compliance with the Air Quality standards and regulations at the time of this inspection.

The five-year compliance history is detailed in the inspection report as follows:

An NOV was issued to AVOCA on December 10, 2008, for emitting 2,464 pounds of n-hexane and 5,236 pounds of hexane isomers (not n-hexane) during an uncontrolled release from the Sclareolide Operation over a three-hour period. DAQ WaRO did not recommend Enforcement because it was found to be an accident (operator error) and the facility had a substantial monetary loss. There was no apparent effect on the local environment.

On June 26, 2012, Avoca conducted a stack test to demonstrate compliance with 40 CFR 63 Subpart DDDDD. They failed to meet boiler emission limits for particulate matter and failed to demonstrate compliance with all boiler emissions limits by the required deadline. An NOV/NRE is pending from DAQ-WaRO.

#### IV. Regulatory Review – Specific Emission Source Limitations

- A. 15A NCAC 02D .0515 “Particulates from Miscellaneous Industrial Processes” – This regulation applies to the rotary dryer and limits PM emissions based on total throughput using the following equation:

$$E = 4.10(P)^{0.67}$$

Where, E = allowable emissions (lb/hr)  
P = process throughput (tph)

According to the application, P = 3.13 @ 0% moisture. Therefore, E calculates to 8.80 lb/hr. Worst-case PM emissions are calculated based on AP-42 emission factor of 3.3 lb/1000 gal for No. 2 fuel oil to be 3.54E-02 lb/hr. Therefore, compliance is indicated. The Permittee shall maintain production records such that the process rates "P" in tons per hour, as specified by the formula contained above (or the formulas contained in 15A NCAC 2D .0515) can be derived, and shall make these records available to a DAQ authorized representative upon request. Due to the wide margin of compliance, no reporting is required.

- B. 15A NCAC 02D .0516 “Sulfur Dioxide Emissions from Combustion Sources” – This regulation applies to facility-wide combustion sources and limits sulfur dioxide (SO<sub>2</sub>) emissions to no greater than 2.3 lb/mmBtu of heat input. Because of the inherently low sulfur content in sage, wood, No. 2 fuel oil, and propane compliance is indicated. No monitoring, recordkeeping, or reporting will be required to demonstrate compliance with this limitation.
- C. 15A NCAC 02D .0521 “Control of Visible Emissions” – Visible emission (VE) standards provided in this regulation are applicable to potential VE emissions from any stack, vent, or outlet. For sources manufactured after July 1, 1971, this regulation limits visible emissions to no more than 20 percent opacity when averaged over a 6-minute period, except that 6-minute periods averaging more than 87 percent opacity may occur not more than once in any hour not more than four times in any 24-hour period.

To ensure compliance, once a day the Permittee shall observe the emission points of the boilers (ID Nos. ES-BB1 and ES-BB2) for any visible emissions above normal. Recordkeeping is required.

Because No. 2 fuel oil and propane firing is associated with inherently low visible emissions, no monitoring, recordkeeping, or reporting shall be required to demonstrate compliance with this limitation for the rotary dryer.

#### V. Regulatory Review – Multiple Emission Source Limitations

- A. 15A NCAC 02Q .0317 for Avoidance of 15A NCAC 02D .0530 “Prevention of Significant Deterioration”  
– The facility has determined that it needs a larger burner to adequately dry the sage. Thus, the new larger burner is requested. The boiler is permitted to burn wood or sage. There is no increase in boiler production. Wood or sage will be fired up to the new boiler heat input. Avoca wants to burn as much sage

as possible, but not trigger PSD for VOC. Because the sage fuel is a byproduct of the process, it is cheaper to burn than wood.

In order to avoid applicability of this regulation, the applicant is requesting that VOC emissions from the boilers and sage drying operations be less than 40 tons per year. Recordkeeping and reporting are required.

The following table taken from the application provides a summary of criteria pollutant emissions. Emissions listed assume 8,760 hours of boiler operation while firing biomass fuel. VOC from the sage drying is based on historical VOC content of the sage leaving the process. Criteria pollutant emissions from fuel combustion in the rotary dryer are calculated based on emission factors found in AP-42 Section 1.3, 9/98 and Section 1.5, 7/08.

Pollutant	Boiler Emissions (tpy)	Dryer Emissions (tpy)	Wood Storage (tpy)	Emissions Increase (tpy)	Significant Emission Rate (tpy)
PM	9.881	0.172	-	10.05	25.0
PM-10	9.881	0.068		9.95	15.0
PM-2.5	9.881	0.068		9.95	10.0
CO	56.8*	11.071		67.8	100.0
NOx	17.9*	19.19		37.1	40.0
SO2	5.26	6.7		11.9	40.0
VOC	3.57	35.1	0.96	39.64	40.0
Lead	5.05E-04	0		5.05E-04	0.6
CO2e	41,937	21,799		63,736	75,000

\*biomass boiler emission factors (0.085 lb/MMBtu for NOx and 0.27 lb/MMBtu for CO)

For any sage sent to the dryer, the applicant will:

- Measure the sage input from the process on a daily basis,
- Measure the hexane content of the sage (lb hexane per lb sage) exiting the process on a weekly basis. The sampling shall include collecting sage material as it exits the desolventizer before it enters the dryer every hour for a 24-hour period once per week.
- Calculate daily VOC emissions by using daily sage input and the lb hexane/lb sage determined weekly for the sage drying until the next weekly result is obtained.

- B. 15ANCAC 02Q .0317 for Avoidance of 15A NCAC 02D .1112 “Case by Case Maximum Achievable Control Technology” – The sage dryer is not subject to any NESHAP. As a result of the increased burner size and the ability of the source to dry sage containing up to 40 % n-hexane, potential HAP emissions could exceed the major source applicability threshold. The applicant is requesting a limit of less than 10 tpy of n-hexane emissions in order to avoid applicability of 112(g). Recordkeeping and reporting are required.
- C. 15A NCAC 02D .1100 “Control of Toxic Air Pollutants” – This state-only regulation applies to facility-wide sources. According to HB 952, sources are exempt from state air toxics if they demonstrate compliance with federal rules for controlling hazardous air pollutants (HAP), unless the director of the state Division of Air Quality determines that their emissions pose unacceptable health risks. This project will result in the following TAPs exceeding the toxic permit emission rate (TPER) found in 02Q .0711: acrolein, benzene, fluorides, formaldehyde, arsenic, beryllium, cadmium, chloroform, n-hexane, and hexane isomers.

The applicant performed a facility-wide air dispersion analysis exercise using AERMOD. Modeling included emissions from the rotary dryer’s increased burner size at its maximum rating for 8,760 hour per year. Even though the dryer is not subject to a federal rule for controlling HAP emissions (MACT, GACT), because it exhausts through the same stack as the biomass boilers which are subject to MACT Subpart DDDDD, no TAP limit is necessary to ensure compliance with the NC AAL.

The modeling analysis was reviewed by Mr. Tom Anderson of the Air Quality Analysis Branch (AQAB). According to Mr. Anderson's memo dated May 16, 2013, the modeling did demonstrate compliance on a source-by-source basis with the NC Acceptable Ambient Level (AAL) found in 02D .1104. Chloroform had the highest impact at 100% of the AAL. DAQ had determined that this modification does not pose unacceptable health risks.

- D. 15A NCAC 02Q .0700 "Toxic Air Pollutant Procedures" – This Rule establishes procedures for documenting compliance for a modification that results in an increase in NC TAP. Compliance can be demonstrated by:
1. Documenting that facility-wide emissions are below the TPER listed in 02Q .0711.
  2. Dispersion modeling to demonstrate compliance with NC AAL.
- E. 15A NCAC 02D .0614 "Compliance Assurance Monitoring" – The requirements of this Rule do not apply to emission limitations or standards propose by the Administrator after November 15, 1990 pursuant to section 111 or 112 of the federal Clean Air Act. The boilers are subject to 112 standards and are thus exempt from CAM. As stated in the application, the rotary dryer has pre-controlled PM emissions less than the CAM applicability threshold. Therefore, CAM does not apply to these sources.
- F. 15A NCAC 02Q .0503(8) "Insignificant Activities" – The applicant has identified a propane vaporizer and 18,000 gallon propane tank as insignificant activities. According to the application, the vaporizer emits less than 5 tpy criteria pollutants and 1000 lb/yr HAP. The propane tank is pressurized with no emissions and is exempt from permitting. The vaporizer is included on the insignificant activity list.
- G. Facility Emissions  
The following table provides a summary of actual facility-wide criteria pollutant emissions based on 2012 AQEI database.

<b>Pollutant</b>	<b>Emission Rate (tpy)</b>
CO	43.64
NOx	24.08
PM-10	0.44
SO2	13.64
VOC	931.29
CO2	33,942
Methane	9.44
Nitrous oxide	1.26

## VI. Other Regulatory Considerations

- An application fee of \$867.00 is required and was received by DAQ.
- The appropriate number of application copies was received by DAQ.
- A Professional Engineer's Seal is required and was included in the application (ref. Dana Norvell, P.E. Seal #028864).
- Avoca is located in an area without local zoning. Construction of this project prior to receipt of a permit was previously approved on April 30, 2013. A sign was placed on the property and public notice was advertised in the local newspaper on March 14, 2013. This serves as the zoning consistency determination.
- Public notice will be required for the 2<sup>nd</sup> step of this significant modification for a two step process allowed under 15A NCAC 02D .0501(c)(2).
- IBEAM TVEE update was verified on November 18, 2013.
- The application was signed by Dr. David Peele, President, on April 25, 2013.

## **VII. Recommendations**

This permit modification request has been reviewed by DAQ to determine compliance with all procedures and requirements. DAQ has determined that this facility appears to be complying or is expected to achieve compliance as specified in the permit with all applicable requirements. A draft was provided to WaRO and the applicant on November 5, 2013.

Issue P/N 01819T41.

**ATTACHMENT E**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Permit Issue Date: June 6, 2013**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Arni Hopkins  
**Date of Last Inspection:** 10/15/2012  
**Compliance Code:** B / Violation - emissions

<p align="center"><b>Facility Data</b></p> <p><b>Applicant (Facility's Name):</b> Avoca Incorporated</p> <p><b>Facility Address:</b> Avoca Incorporated 841 Avoca Farm Road Merry Hill, NC 27957</p> <p><b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing</p> <p><b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V</p>			<p align="center"><b>Permit Applicability (this application only)</b></p> <p><b>SIP:</b> <b>NSPS:</b> <b>NESHAP:</b> <b>PSD:</b> <b>PSD Avoidance:</b> Yes <b>NC Toxics:</b> <b>112(r):</b> <b>Other:</b></p>								
<p align="center"><b>Contact Data</b></p> <table border="1"> <thead> <tr> <th align="center">Facility Contact</th> <th align="center">Authorized Contact</th> <th align="center">Technical Contact</th> </tr> </thead> <tbody> <tr> <td>Brian Conner Environmental Health &amp; Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957</td> <td>David Peele Owner / President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957</td> <td>Brian Conner Environmental Health &amp; Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957</td> </tr> </tbody> </table>			Facility Contact	Authorized Contact	Technical Contact	Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	David Peele Owner / President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	<p align="center"><b>Application Data</b></p> <p><b>Application Number:</b> 0800044.13A <b>Date Received:</b> 04/12/2013 <b>Application Type:</b> Modification <b>Application Schedule:</b> TV-Sign-501(c)(2) <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 01819/T39 <b>Existing Permit Issue Date:</b> 01/04/2013 <b>Existing Permit Expiration Date:</b> 07/31/2015</p>		
Facility Contact	Authorized Contact	Technical Contact									
Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	David Peele Owner / President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957									
<p><b>Review Engineer:</b> Kevin Godwin</p> <p><b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____</p>			<p align="center"><b>Comments / Recommendations:</b></p> <p><b>Issue</b> 01819/T40 <b>Permit Issue Date:</b> 06/06/2013 <b>Permit Expiration Date:</b> 07/31/2015</p>								

**I. Introduction and Purpose of Application**

- A. Avoca owns and operates a facility that extracts oils and nutrients from various plants for use in flavorants, fragrances, food additives and dietary supplements. Process operations include a rotocel, recovery, sclareol re-crystallization (SFG), sclareolide (SDE), ethyl vanillin glucoside (EVG), plant nutrient extraction (PNE), botanical extraction, and biomass extraction.
- B. This permit action is being made to modify the SFG operations by replacing the current dryer with a new larger capacity dryer (ID No. D-3001) as well as add a new larger reactor (ID No. R-3002) equipped with a process condenser (ID No. EX-3003). As stated in the application, the current reactor will be utilized as a secondary reactor (R-3001).
- C. It is also requested that dry lime injection for bagfilter (ID No. CD-BB1BH) not be required and deleted from the control scenario. As stated in the application, during initial design, it was thought that lime injection may be needed to demonstrate compliance with the HCl limit found in boiler MACT. Based on two compliance tests without using lime injection the results were less than the limit (June 2012 test 0.00010 lb/MMBtu versus limit of 0.004 lb/MMBtu and February 2013 test 0.0026 lb/MMBtu versus limit



of 0.022 lbMMBtu). Due the margin of compliance, DAQ grants this request and all reference to lime injection is removed.

## II. Changes to Existing Permit

The following table provides a summary of change made to the existing permit:

Page No.	Condition No.	Description of Change(s)
Global	Global	Removed reference to lime injection for bagfilter (ID No. CD-BB1BH)
4	Table of Emission Sources	Updated SFG ID numbers per Table 2.1 of the application.
25	2.2 A Table	Removed reference to state-only toxic air pollutants (TAP).
Old page 26	2.2 A.2.	Removed TAP condition pertaining to 15A NCAC 02D .1100.
Old page 26	2.2 A.4.	Removed condition pertaining to 15A NCAC 02Q .0705 and .0711.
New page 26	2.2 A.3.	Included condition requiring a TAP evaluation for increases from non-NESHAP sources.
43	2.2 C.	Updated SFG ID numbers per Table 2.1 of the application.
50	2.2 C.2.	Included PSD avoidance condition limiting VOC emissions from SFG operations to 95.29 tons per 12 month rolling period.
50	2.2 C.3.	Included condition for MON Group 1 batch process vent avoidance.

## III. Statement of Compliance

Avoca was last inspected on October 15, 2012 by Mr. Arni Hopkins of the Washington Regional Office (WARO). According to the inspection report, the sources appeared to be in compliance with the conditions of the permit and all applicable regulations at the time of inspections.

## IV. Regulatory Review – Specific Emission Source Limitations

Existing Specific Emission Source Limitations are not affected by this modification.

## V. Regulatory Review – Multiple Emission Source Limitations

A. According to the application, currently the sclareol re-crystallization (SFG) utilizes the following equipment to produce higher purity sclareol:

- T-3001 – 6,700 gallon Hexane Storage Tank;
- ES-1003-10-P – Four process tanks;
- ES-1003-10-F – Process equipment leaks;
- C-3001 – one centrifuge with exhaust to chilled water condenser (CD-3001);
- D-3001 – one reactor with exhaust sent to chilled water condenser (CD-3001);
- D-3001d – one dryer with exhaust sent to chilled water condenser (CD-3001);
- ES-1003-10-WW – SFG process wastewater stream.

In the SFG operations, the material extracted from the rotocel operations is mixed with hexane (95% n-hexane and 5% hexane isomers) and ethyl acetate and sent through a drying step to generate a powder form of sclareol. This powder is sent off-site for an additional processing step before being brought back to the site for further processing into sclareolide (final product) in the SDE operation.

A small amount of hexane remains in the product and some is lost in equipment leaks and as fugitive emissions. Avoca tracks hexane usage and reports hexane used as hexane lost via a material balance on a monthly basis. Avoca used the actual emissions data prorated to maximum potential to determine potential emissions and emissions increases.

**B. New Source Review Applicability**

Avoca is located in Bertie County which is currently in attainment for all pollutants. Avoca is a chemical plant with a 100 tpy criteria pollutant major source threshold and facility fugitive emissions must be included in the applicability determination.

The applicant originally proposed using the baseline actual-to- projected actual emissions test to demonstrate that the project would not trigger PSD. However, the project results in an 84% increase in capacity that the process is not currently able to accommodate. An 84% increase in emissions results in a greater than significant increase in VOCs. The NCDAQ contacted the applicant's consultant and informed them that the project would be subject to PSD. The applicant responded by requesting an emissions cap using baseline actual emissions + 40 tpy. In order to avoid PSD review, the facility has decided to take a limit of 95.29 tpy or baseline actual emissions (BAE) plus 40 tpy. Based on reported actual hexane usage rates, the highest 24-month BAE are 55.29 tpy. Therefore, the facility requests an emission limit of 95.29 tons per 12 months rolling period. Recordkeeping and reporting are required.

It is important to note that this cap of 95.29 tpy is less than the projected actuals included in the original application (see attached for calculations). The issue of whether this permit was a "sham" permit to allow construction and operation and later relax this limit was discussed with the applicant's consultant. The NCDAQ requested the facility's responsible official to sign the letter requesting the PSD avoidance limit. If at some later date the applicant requests to relax this limit, or this limit is exceeded, this PSD avoidance limit should be treated as a sham and the PTE of the unit should be used to determine PSD applicability as if the limit was never taken.

*De-bottlenecking:*

According to the application, after the SFG operations, the product is sent off-site for further processing. The product then returns for final processing in the SDE operations. The SDE operations currently process refined material processed from the off-site vendor or refined material is purchased from a China vendor and then further processed in SDE. As a result of the returned refined material from off-site and the additional purchases from China, the current production of SDE is already higher than the production of SFG. Due to this additional production at the SDE side versus the SFG, the applicant feels that there is no downstream debottlenecking in the SDE process. The SDE process could currently operate at its PTE or PAE if enough refined product was brought from China or if the SFG operations were increased.

**C. NESHAP Applicability**

The SFG operations are subject to 40 CFR 63 Subpart FFFF - Miscellaneous Organic Chemical Manufacturing (MON). The SFG operations were previously determined to be Group 2 batch process vents. The facility has calculated n-hexane emission per batch factor. The total batch HAP emissions are determined based on the annual number of batches of SFG and the batch factor.

For this modification, Avoca has updated the calculation approach and determined an updated lb/batch emission rate for each of the three batch types. Based on the updated emission rates per batch and the potential number of batches, Avoca could potentially exceed the 10,000 lb/yr threshold and become a Group 1 source. Avoca is requesting an enforceable limit to keep the collective uncontrolled HAP to less than 10,000 lb/yr. This will allow the facility to remain classified as a Group 2 batch process unit MCPU under the MON. DAQ grants this request. A condition limiting uncontrolled HAP emissions to less than 10,000 lb/yr is included in the revised permit.

**D. Compliance Assurance Monitoring (CAM)**

CAM does not apply to this modification as the SFG operations are subject to NESHAP Subpart FFFF.

**E. State-only Toxic Air Pollutants (TAP)**

The current permit includes a condition referencing 15A NCAC 02D .1100. The condition includes a table which provides limits for several TAP from different sources throughout the plant. The condition also includes operational restrictions, monitoring, and recordkeeping to ensure the limits are not exceeded.

Based on recent legislative action exempting sources subject to 40 CFR Part 61 or 63 from the North Carolina Air Toxics program, sources that are subject to MACT, GACT, or 112(j) requirements are exempt. The SFG operations are subject to the MON NESHAP. Avoca has provided air dispersion modeling that demonstrates compliance with NC Air Toxics. The modeling was reviewed by Mr. Alex Zarnowski of the Air Quality Analysis Branch (AQAB) on May 1, 2013. According to the memo, the modeling adequately demonstrates facility-wide compliance on a source-by-source basis for n-hexane and hexane isomers. The pollutant with maximum impact is n-hexane at 91.73% of the Acceptable Ambient Level (AAL). Avoca requests to remove TAP from the permit for all sources covered under the NESHAP. DAQ agrees that this is not an unacceptable risk. Therefore, the request is granted. A condition will be included in the revised permit requiring a TAP evaluation for increases from any non-NESHAP sources.

- F. Facility Emissions – The following table, taken from the AQEI database for 2011, provides a summary of actual annual emissions.

Pollutant	Emission Rate
CO	2.79 tpy
NOx	13.79 tpy
PM-10	0.66 tpy
SO2	17.06 tpy
VOC	491.3 tpy
CO2	8,970 tpy
Methane	0.0257 tpy
n-hexane	104,693.65 pounds
Hexane isomers except n-hexane	723,161.35 pounds

## VI. Other Regulatory Considerations

- An application fee of \$889.00 is required and was received by DAQ.
- The appropriate number of application copies was received by DAQ.
- A Professional Engineer's seal is required and was included (ref. Dana Norvell, P.E. Seal #028864).
- Avoca is located in an area without local zoning. Construction of this project prior to receipt of a permit was previously approved on April 30, 2013. A sign was placed on the property and public notice was advertised in the local newspaper on January 17, 2013. This serves as the zoning consistency determination.
- Public notice will be required for the 2<sup>nd</sup> step of this significant modification for a two step process allowed under 15A NCAC 02D .0501(c)(2).
- IBEAM TVEE update was verified on May 20, 2013.
- The application was signed by Dr. David Peele, President, on April 11, 2013.

## VII. Recommendations

This application for a permit revision has been reviewed by DAQ to determine compliance with all procedures and requirements. DAQ has determined that this facility appears to be complying or is expected to achieve compliance as specified in the permit with all applicable requirements. A draft was provided to Betsy Huddleston (WARO) and Brian Conner, Avoca on May 24, 2013.

Issue P/N 1819T40

Attachment A (original PSD calculations relying on BAE to PAE)  
Attachment B (revised baseline and request for PSD limit)

## **Attachment F**

**(The following is an excerpt from a prior revision of this review and is intended to memorialize the calculations originally relied upon by the applicant. As noted in the PSD/NSR review section this approach was not acceptable to demonstrate that PSD did not apply and the applicant revised its approach and requested a PSD emissions cap.)**

B. New Source Review Applicability

Avoca is located in Bertie County which is currently in attainment for all pollutants. Avoca is a chemical plant with a 100 tpy criteria pollutant major source threshold and facility fugitive emissions must be included in the applicability determination.

The proposed modification will result in an increase in VOC emissions. As seen in the following table taken from the application, facility calculations indicate the increase will be less than significant and therefore, PSD review is not required.

Pollutant	SFG Unadjusted PAE (tpy)	Could Have Accommodated (tpy)	SFG Adjusted PAE (tpy)	Baseline Actual (tpy)	Increase (tpy)	PSD SER (tpy)	Trigger PSD
VOC	114.26	27.39	86.87	47.90	38.96	40	no

Pursuant to 40 CFR 51.166(a)(7)(iv)(c), Avoca used the actual-to-projected actual emission test to determine the increase. The calculation method is described in the application as follows:

Step 1 – Baseline Actual Emissions (BAE) are based on the highest actual monthly VOC inventory data of the SFG operations occurring during the 24-month baseline period. The highest two year average VOC usage of 47.9 tpy occurred during November 2010 and October 2012.

Step 2 – Projected Actual Emissions (PAE) were calculated using the following steps. The VOC BAE was increased to reflect operation for all days in the monthly periods over the two year period that was averaged to annual emissions for this analysis. To estimate the PAE after the modification, the emissions from the previous step were increased by a factor of 1.84 to account for the new reactor design to calculate the “unadjusted” PAE.

Step 3 – Could Have Accommodated emissions may be established by determining the incremental annual production rate over the baseline production rate occurring within the 24-month period used to establish the BAE. The highest monthly VOC usage occurred in July of 2012 during the baseline period. Annual production rate based on the demonstrated rate is calculated as follows:

$$\text{Could have accommodated} = (12,790 \text{ lb VOC/month}) / (31 \text{ days}) = 413 \text{ lb VOC/day} \\ 413 \text{ lb VOC/day} * 365 \text{ days/year} / 2000 \text{ lb/ton} = 75.29 \text{ tpy VOC}$$

This rate is less than the maximum PAE rate of 114.26 tpy VOC. Could have accommodated emissions were calculated based on the incremental production rate over the baseline production rate that the unit could have accommodated prior to this project, calculated as follows:

$$\text{Incremental Production/Emission Rate} = 75.26 \text{ tpy} - 47.9 \text{ tpy} = 27.39 \text{ tpy}$$

Step 4 – Adjusted PAE are calculated based on Unadjusted PAE minus Could have accommodated emissions.

Step 5 – Compare change to PSD Significant Emission Rates (SER). As shown in the table above, VOC emissions are less than the SER of 40 tpy.

A PSD avoidance condition is included in the revised permit pertaining to 15A NCAC 02D .0530(u) “Use of Projected Actuals.”

Using the same approach, the VOC emissions increase from the SDE operations are calculated to be 0.84 tpy.

*De-bottlenecking:*

According to the application, after the SFG operations, the product is sent off-site for further processing. The product then returns for final processing in the SDE operations. The SDE operations currently process refined material processed from the off-site vendor or refined material is purchased from a China vendor and then further processed in SDE. As a result of the returned refined material from off-site and the additional purchases from China, the current production of SDE is already higher than the production of SFG. Due to this additional production at the SDE side versus the SFG, the applicant feels that there is no downstream debottlenecking in the SDE process. The SDE process could currently operate at its PTE or PAE if enough refined product was brought from China or if the SFG operations were increased.

## **Attachment G**

**(Revised baseline calculations and request for PSD limit)**

**ATTACHMENT G**

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

**Air Permit Review**

**Permit Issue Date: 3 June 2011**

**Region:** Washington Regional Office  
**County:** Bertie  
**NC Facility ID:** 0800044  
**Inspector's Name:** Arni Hopkins  
**Date of Last Inspection:** 03/30/2011  
**Compliance Code:** 3 / Compliance - inspection

<p align="center"><b>Facility Data</b></p> <p><b>Applicant (Facility's Name):</b> Avoca Incorporated</p> <p><b>Facility Address:</b> Avoca Incorporated 841 Avoca Farm Road Merry Hill, NC 27957</p> <p><b>SIC:</b> 2087 / Flavoring Extracts And Syrups,nec <b>NAICS:</b> 31193 / Flavoring Syrup and Concentrate Manufacturing</p> <p><b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V</p>			<p align="center"><b>Permit Applicability (this application only)</b></p> <p><b>SIP:</b> 02D .0503, .0515, .0516, .0521, <b>NSPS:</b> Subpart Dc <b>NESHAP:</b> Subpart DDDDD <b>PSD:</b> <b>PSD Avoidance:</b> <b>NC Toxics:</b> 02D .1100 and 02Q .0700 <b>112(r):</b> <b>Other:</b></p>							
<p align="center"><b>Contact Data</b></p> <table border="1"> <tr> <td align="center"><b>Facility Contact</b></td> <td align="center"><b>Authorized Contact</b></td> <td align="center"><b>Technical Contact</b></td> </tr> <tr> <td>Brian Conner Environmental Health &amp; Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957</td> <td>David Peele President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957</td> <td>Brian Conner Environmental Health &amp; Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957</td> </tr> </table>			<b>Facility Contact</b>	<b>Authorized Contact</b>	<b>Technical Contact</b>	Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	David Peele President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	<p align="center"><b>Application Data</b></p> <p><b>Application Number:</b> 0800044.11B <b>Date Received:</b> 03/23/2011 <b>Application Type:</b> Modification <b>Application Schedule:</b> TV-Sign-501(c)(2) <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 01819/T37 <b>Existing Permit Issue Date:</b> 08/17/2010 <b>Existing Permit Expiration Date:</b> 07/31/2015</p>	
<b>Facility Contact</b>	<b>Authorized Contact</b>	<b>Technical Contact</b>								
Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	David Peele President (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957	Brian Conner Environmental Health & Safety Manager (252) 482-2133 Post Office Box 129 Merry Hill, NC 27957								
<p><b>Review Engineer:</b> Kevin Godwin</p> <p><b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____</p>			<p align="center"><b>Comments / Recommendations:</b></p> <p><b>Issue</b> 01819/T38 <b>Permit Issue Date:</b> 06/03/2011 <b>Permit Expiration Date:</b> 07/31/2015</p>							

**I. Introduction and Purpose of Application**

- A. Avoca Inc. owns and operates a facility that extracts oils and nutrients from various types of plants for use in flavorants, fragrances, food additives, and dietary supplements. The main product at this facility is sclareol which is extracted from sage grown on the Avoca farm.
- B. This application is made for a revision to the existing permit for the installation and operation of:
- two new biomass/bio-based solids-fired boilers (18.6 million Btu per hour maximum heat input, ID Nos. ES-BB1 and ES-BB2) controlled by a cyclone (144 inches in diameter, ID No. CD-BB1C) in series with a dry lime injected bagfilter (8,900 square feet of filter area, ID No. CD-BB1BH), and
  - one No. 2 fuel oil-fired rotary dryer (6.0 million Btu per hour maximum heat input, ID No. ES-RD).

According to the application, the boilers will fire sage from the sclareolide operations to produce process steam. Sage will be fired during the harvest season (approximately June through August). Wood will be fired from September through May. No other fuels are permitted to be fired in the boilers. Wood chips will be brought on site and stored year round.



- C. Because this permit action involves a significant change to existing monitoring terms or conditions, it is considered a significant modification under 15A NCAC 02Q .0516. Rule 02Q .0501(c)(2) allows the facility to obtain a construction and operation permit following the procedures under Rule .0504 and file a complete application within 12 months after commencing operation to modify the permit to meet the requirements of the Title V program. Avoca has requested that the application be processed in this manner.

## II. Changes to Existing Permit

The following table describes the changes in Permit No. 01819T38 as part of this renewal process.

Page No.	Condition No.	Description of Change(s)
3	Table of Permitted Sources	Included two boilers (ID Nos ES-BB1 and ES-BB2) and associated control devices and rotary dryer (ID No. ES-RD). Moved three emergency generators and fire water pump (ID No. E101, E102, E103, and FP) from insignificant activity list.
8	Footnote to Table	Included language pertaining to significant modification under 15A NCAC 02Q .0501(c)(2).
20	2.1 E.	Included two boilers (ID Nos. ES-BB1 and ES-BB2) and associated control devices and rotary dryer (ID No. ES-RD) and all applicable regulations.
20	2.1 E.1	Included requirement for Permittee to test one of the boilers within 60 days of start-up for CO and NOx in order to verify emission factors used to support the application.
35	2.1 F.	Included three emergency generators and fire water pump (ID No. E101, E102, E103, and FP) with all applicable regulations.
37	2.2 A.2.	Included source-by-source limits for toxic air pollutants modeled pursuant to 15A NCAC 02D .1100.
66	3	Updated General Conditions to most recent shell version (v3.4).

## III. Statement of Compliance

Avoca was last inspected by Mr. Arni Hopkins of the Washington Regional Office (WaRO) on March 30, 2011. According to Mr. Hopkins' inspection report, the facility appeared to be in compliance with all applicable air quality regulations. The inspection report includes the five year compliance history as follows:

"An NOV was issued to AVOCA on December 10, 2008, for emitting 2,464 pounds of n-hexane and 5,236 pounds of hexane isomers (not n-hexane) during an uncontrolled release from the Sclarolide Operation over a three-hour period. DAQ WaRO did not recommend Enforcement because it was found to be an accident (operator error) and the facility had a substantial monetary loss. There was no apparent effect on the local environment.

An NOV was issued to AVOCA on June 19, 2006, for failing to demonstrate compliance for the PSD VOC emission limits of the Botanical and Biomass Extraction Processes. The Botanical Process had a stack test performed but a report was never submitted to DAQ. The Biomass Process never was tested. DAQ WaRO did not recommend Enforcement because the requirement was changed in T33.

An NOV/NRE was issued to AVOCA on February 15, 2006, for 1) exceeding the daily emission rate of n-hexane, 2) failing to report the exceedance in accordance with the provisions outlined in the permit, and 3) operating the Biomass Extraction process with only one cryo-condenser available (which meant that when it had to be removed from service to thaw, the waste gas stream was directed to the atmosphere with no controls). An Enforcement Action was taken against AVOCA.

An NOV/NRE was issued to AVOCA on January 23, 2006, for 1) operating a mineral oil scrubber outside its permitted temperature range and 2) not performing wastewater sampling as required by the permit. Also mentioned in the letter was that AVOCA needs to review Leak Detection and Repair (LDAR)

requirements, and adjust test locations, frequencies, and records accordingly. An Enforcement Action was taken against AVOCA.”

#### IV. Regulatory Review – Specific Emission Source Limitations

- A. Wood Storage Piles – Fugitive VOC emissions from the storage piles are estimated based on NCASI technical bulletin VOC emissions from Wood Residuals Storage Piles (Technical Bulletin No. 700, Oct. 1995). Potential VOC emissions are reported in the application to be 0.74 tpy. No regulation applies to the storage piles.
- B. Two Biomass Boilers and Rotary Dryer – The boilers will burn sage and wood. For this application, wood combustion factors from AP-42, Section 1.6 Wood Residue Combustion in Boilers Bark and Wet Wood were used to estimate emissions for both wood and sage. According to the application, the exhaust from the boilers will be sent to a rotary dryer to dry the sage to about 50% moisture. Any remaining hexane from the process will be driven off at the drying operations. The exhaust air from the dryer is sent to a cyclone and dry lime injection bagfilter prior to exhausting to the atmosphere. DAQ control device spreadsheets were used to verify the effectiveness of the cyclone and bagfilter. The following regulations apply:
  1. 15A NCAC 02D .0503 “Particulates from Fuel Burning Indirect Heat Exchangers” – This regulation applies to the boilers and limits particulate matter (PM) emissions from the firing of fuel in indirect heat exchangers (in lb/MMBtu) based on the facility-wide heat input. For facilities with a total heat input of greater than 10 MMBtu/hr, the allowable PM emission rate is calculated using the following equation:

$$E = 1.090 * Q^{-0.2594}$$

Where:

E = Allowable emission limit for particulate matter in lbs/MMBtu; and,

Q = Maximum total site heat input in MMBtu/hr.

As reported in the application, Q = 103.1 MMBtu/hr. Therefore, E calculates to 0.33 lb/MMBtu or 6.14 lb/hr for each new boiler. For PM control, the boilers share a common cyclone in series with a bagfilter.

Using AP-42, Section 1.6 Wood Residue Combustion in Boilers Bark and Wet Wood emission factors, after control PM emissions from both boilers combined are calculated to be 4.22E-02 lb/hr. Therefore, compliance is indicated.

To ensure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer’s inspection and maintenance recommendations, or if there is no manufacturer’s inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:

monthly external inspection of the ductwork, cyclone, and bagfilter noting the structural integrity; and  
annual internal inspection of the bagfilter's structural integrity.

Recordkeeping and reporting are required.

2. 15A NCAC 02D .0515 “Particulates from Miscellaneous Industrial Processes” – This regulation applies to the No. 2 fuel oil-fired rotary dryer and limits PM emissions based on total throughput using the following equation:

$$E = 4.10(P)^{0.67}$$

Where, E = allowable emissions (lb/hr)  
P = process throughput (tph)

According to the application, P = 3.13 @ 0% moisture. Therefore, E calculates to 8.80 lb/hr. PM emissions are calculated based on AP-42 emission factor of 3.3 lb/1000 gal to be 1.41E-01 lb/hr. Therefore, compliance is indicated. The Permittee shall maintain production records such that the process rates "P" in tons per hour, as specified by the formulas contained above (or the formulas contained in 15A NCAC 2D .0515) can be derived, and shall make these records available to a DAQ authorized representative upon request. Due to the wide margin of compliance, no reporting is required.

3. 15A NCAC 02D .0516 "Sulfur Dioxide Emissions from Combustion Sources" – This regulation applies to facility-wide combustion sources and limits sulfur dioxide (SO<sub>2</sub>) emissions to no greater than 2.3 lb/mmBtu of heat input. Because of the inherently low sulfur content in sage and wood, compliance is indicated. No monitoring, recordkeeping, or reporting will be required to demonstrate compliance with this limitation.
4. 15A NCAC 02D .0521 "Control of Visible Emissions" – Visible emission (VE) standards provided in this regulation are applicable to potential VE emissions from any stack, vent, or outlet. This regulation limits visible emissions to no more than 20 percent opacity when averaged over a 6-minute period, except that 6-minute periods averaging more than 87 percent opacity may occur not more than once in any hour not more than four times in any 24-hour period.

To ensure compliance, once a day the Permittee shall observe the emission points of the boilers (ID Nos. ES-BB1 and ES-BB2) for any visible emissions above normal. The Permittee shall establish "normal" for the boilers in the first 30 days following the effective date of the permit. Recordkeeping is required.

Because No. 2 fuel oil firing is associated with inherently low visible emissions, no monitoring, recordkeeping, or reporting shall be required to demonstrate compliance with this limitation for the rotary dryer.

5. 15A NCAC 02D .0524 "New Source Performance Standards – Subpart Dc" – 40 CFR Part 60, Subpart Dc applies to units that began construction after June 9, 1989 and has a maximum heat input between 10 and 100 million Btu/hr. This regulation applies to the boilers. The facility is not subject to any PM, opacity, or SO<sub>2</sub> standards listed in Subpart Dc. Written notification is required for:
  - a. Notification of the date construction is commenced.
  - b. Notification of the actual date of initial start-up.

60.48c(a)(1) requires inclusion of the design heat input of the boilers along with the types of fuels to be combusted.

60.48c(g) requires the facility to record and maintain the amounts of each fuel used during the calendar month. No reporting is required.

6. 15A NCAC 02D .1111 "National Emission Standards for Hazardous Air Pollutants – Subpart DDDDD" – On May 16, 2011, EPA stayed the effective date of this Rule. A condition is included in the permit (Specific Condition 2.1E.7.) detailing the Permittee's requirements under this Subpart. Testing, monitoring, recordkeeping, and reporting are required. However, the requirements will not be effective until EPA completes their reconsideration.

7. 40 CFR Part 241 –“Commercial/Industrial Solid Waste Incinerators (CISWI)” – On February 21, 2011, EPA promulgated final regulations to identify under what circumstances that non-hazardous secondary materials, when fired in combustion sources, are designated as either solid wastes or not as solid wastes. Units firing solid waste must comply with CISWI regulations. Units deemed not to be firing solid wastes must comply with Subpart DDDDD. The facility has determined that the sage material and wood are not solid wastes as defined in 40 CFR Part 241, and therefore not subject to CISWI regulations.
- a. The applicant uses the following justifications for **not** designating sage as a solid waste:
    - i. The sage remains within the control of the generator,
    - ii. The sage will be burned as fuel on a continuous basis as it is removed from the extraction process and dried,
    - iii. The only other fuel that is proposed for the boiler is wood. Heat inputs and composition of the two fuel is similar. Emissions from burning sage will be less than or no greater than expected from burning wood.
    - iv. The sage Btu content is an average 3,843 Btu per pound at 50% moisture, which is similar to wood firing. As such, the material has a meaningful heating value and will be fired in a boiler that recovers energy to develop process steam.
    - v. The unit is designed to burn sage as well as wood. Both fuels are similar.
    - vi. As indicated in the application, there could be small amounts of residual hexane from the process. The residual hexane will be evaporated in the sage drying operations prior to firing in the boilers.
  - b. The applicant uses the following justifications for **not** designating wood as a solid waste:
    - i. Wood is considered a traditional fuel.
    - ii. The facility is proposing using virgin wood a fuel. The wood has not been previously discarded. Wood will be purchased in the form of chips from local loggers. The wood received will be green at approximately 50% moisture. There are no plans to fire wood from any wood processing plants, or pre-processed wood.
8. 15A NCAC 02D .0530 “Prevention of Significant Deterioration (PSD)” – The facility is a chemical plant with a PSD major source threshold of 100 tpy. Because potential emissions exceed the major source threshold, the facility is classified as a major source. Addition of the two boilers and drying system does not cause an increase of any regulated pollutant above the PSD significance levels. Therefore, this project does not trigger PSD review. The following table taken from the application provides a summary of emissions related to this project:

<b>Pollutant</b>	<b>Boilers (tpy)</b>	<b>Dryer (tpy)</b>	<b>Wood Storage (tpy)</b>	<b>Emissions Increase (tpy)</b>	<b>Significant Emission Rate (tpy)</b>
PM	0.179	0.619	-	0.8	25.0
PM-10	0.160	0.188	-	0.3	15.0
PM-2.5	0.160	0.047	-	0.2	10.0
CO	99.0	0.939	-	99.9	100.0
NOx	35.8	3.75	-	39.6	40.0
SO <sub>2</sub>	4.07	13.3	-	17.4	40.0
VOC	2.77	27.4	0.743	30.92	40.0
Lead	3.91E-04	0	-	3.91E-04	0.6
CO <sub>2</sub> e	32,501	4,300	-	36,801	75,000

All emissions are estimated based on AP-42 emission factors or DAQ guidance found in approved spreadsheets. In order to verify emission factors for CO (0.54 lb/MMBtu) and NOx (0.22 lb/MMBtu) used for calculating emissions in support of the application, the facility is required to test one boiler within 60 days after start-up.

## **V. Regulatory Review – Multiple Emission Source Limitations**

- A. 15A NCAC 02D .1100 “Control of Toxic Air Pollutants” – This regulation applies to facility-wide sources. Pursuant to 15A NCAC 02Q .0702(a)(18), new or modified combustion sources permitted after July 10, 2010 are no longer exempt from 02D .1100. Therefore, addition of the new boilers requires new and existing sources to be evaluated for common toxic air pollutants (TAP). This project will result in the following TAPs exceeding the toxic permit emission rate (TPER) found in 02Q .0711: acrolein, benzene, fluorides, formaldehyde, arsenic, beryllium, cadmium, chloroform, n-hexane, and hexane isomers. Air dispersion modeling is required.

An air dispersion modeling exercise was conducted using AERMOD. The modeling analysis was reviewed by Mr. Jerry Freeman of the Air Quality Analysis Branch (AQAB). According to Mr. Freeman’s memo dated April 26, 2011, the modeling did demonstrate compliance on a source-by-source basis with the NC Acceptable Ambient Level (AAL) found in 02D .1104. Arsenic had the highest impact at 96% of the AAL.

The modeled emission rates are placed in the permit as limits. To ensure compliance with the Arsenic limit, the facility has chosen to take a restriction of 2.5 million gallons per year of No. 2 fuel oil combustion. Recordkeeping is required. Because all other pollutants were modeled as being emitted continuously (i.e. 8,760 hours per year), no restrictions are necessary.

- B. 15A NCAC 02Q .0700 “Toxic Air Pollutant Procedures” – This Rule establishes procedures for documenting compliance for a modification that results in an increase in NC TAP. Compliance can be demonstrated by:
1. Documenting that facility-wide emissions are below the TPER listed in 02Q .0711.
  2. Dispersion modeling to demonstrate compliance with NC AAL.
- C. 15A NCAC 02D .0614 “Compliance Assurance Monitoring” – The requirements of this Rule do not apply to emission limitations or standards proposed by the Administrator after November 15, 1990 pursuant to section 111 or 112 of the federal Clean Air Act. The boilers are subject to 112 standards and are thus exempt from CAM. As stated in the application, the rotary dryer has pre-controlled PM emissions less than the CAM applicability threshold. Therefore, CAM does not apply to these sources.

## **VI. Other Regulatory Considerations**

- An application fee of \$867.00 is required and was included with the application.
- The appropriate number of application copies was received by DAQ.
- The application included the Reduction and Recycling Form (A4).
- A Professional Engineer’s Seal is required and was included on Form D5 (ref. Dana Norvell, P.E. Seal #028884).
- This area of Bertie County is not zoned. As such, the facility provided proof that it had followed the procedures under 15A NCAC 02Q .0113 “Notification in Areas without Zoning.”
- Public notice is not required for this application (Step 1 of a 15A NCAC 02Q .0501(c)(2) modification). Public notice and EPA review will be associated with Step 2.
- IBEAM Title V Equipment Editor (TVEE) update was verified on May 13, 2011.
- According to the application, the facility does not store any chemicals above the 112r applicability threshold.
- The application was signed by Dr. David Peele, President, on March 21, 2011.

## **VII. Recommendations**

This application for a permit modification for Avoca Inc. has been reviewed by DAQ to determine compliance with all applicable procedures and requirements. DAQ has determined that this facility appears to be complying or is expected to achieve compliance as specified in the permit with all applicable regulations.

A draft was provided to the applicant and WaRO on May 20, 2011.

Issue Permit No. 01819 R38.